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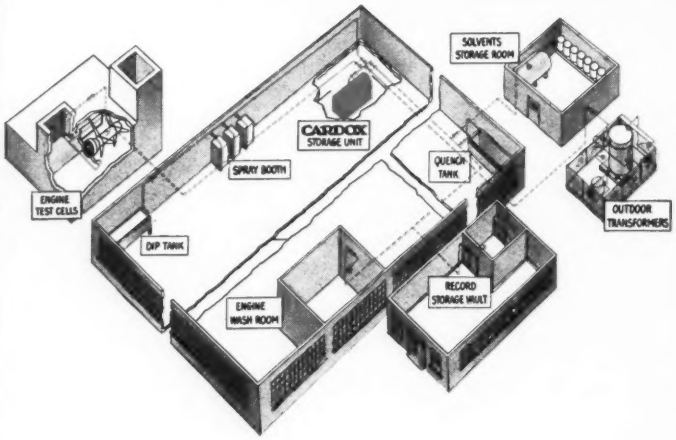
Fire Quarterly

of the

National Fire Protection Association

INTERNATIONAL

Promoting the Science and Improving the Methods of Fire Prevention and Protection Since 1896



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Vol. 48, No. 3 January 1955

Quarterly

The Standard Technical Journal of Fire Protection for More Than Forty Years

The NFPA is a non-profit technical and educational organization devoted to the reduction of loss of life and property by fire with a total membership of 15,000. The *Quarterly* is one of the publications regularly provided to members. Other membership publications include a monthly *Fire News, Advance Reports* and *Proceedings* of the Annual Meetings, a *Year Book,* and many leaflets, pamphlets and posters issued throughout the year on fire prevention and control. Six volumes of the National Fire Codes are available on an annual subscription basis, one volume free and others at reduced membership rates. For full details on available material ask for the free "List of NFPA Publications."

NFPA annual dues are $12.50 for Associate Membership of which $5.00 is for subscription to this Journal. National and regional societies or associations may apply for an organization membership for which annual dues are $100; such a membership entitles four individuals to receive the periodical membership publications.

Technical committees of the Association develop means to safeguard life and property through the publication of standards covering all phases of fire prevention and protection. Your membership in the Association affords an opportunity to keep abreast of these developments and, by being a member, you help support this humanitarian activity. Popular educational literature on fire safety is constantly being produced by the NFPA for distribution through its members to the general public.

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International
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of the

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Accounts of fires appearing in the Quarterly are based on reports forwarded to the Association except where otherwise indicated. The Association, as a body, does not assume responsibility for the accuracy of the fire reports printed herein.

This publication is indexed by Engineering Index, Inc.

Fire, the killer, is fire in the home. Small fires which take the lives of the young and the old; 12,550 lives in the United States and Canada annually. Fatal fires like those in these seven dwellings.

Photo credits: (Top to bottom, left to right): Wide World, River Falls Fire Dept., United Press, Columbia Fire Dept., Baltimore Fire Dept., United Press, Wide World.

Editorials

Still Our Greatest Challenge!

HUMAN ignorance and unbelievable indifference to obvious fire hazards are the prime factors in the appalling and constantly recurring stories of loss of life fires that find their way into our fire record department — especially in the winter months.

In Massachusetts last January in a small home a portable oil stove had been smoking badly all day. In spite of the obvious danger, four children were left alone in the house. All were burned to death.

The next day in Nebraska four children and their mother died when the home burned because hot ashes were dumped in a cardboard carton. A few days later in Louisiana five small children were locked in with a leaky oil stove. All died from the ensuing fire. In Michigan eight old people were trapped in a nursing home by a fire started by a portable electric heater placed under combustible drapes near the foot of an open stairway!

Is there any hazard more obvious than pouring kerosene or fuel oil on a wood fire? Six people died from this in one fire in Arkansas last February. Nine, including six children, met the same fate in a fire in West Virginia in March and a mother and her five children in Ohio in April. Also in April, a mother and her six children in Alabama.

And on Christmas day ten children and one adult died the same fiery death from the same cause in a house in Arkansas!

Must we continue to anticipate such heart-rending tragedies? The only answer, as we see it, is a continuing persistent educational effort. That is why we believe so strongly in the Fire Prevention Campaign conducted by the Advertising Council under NFPA sponsorship. Through this campaign we can repeat over and over again in newspapers, magazines, house organs, car cards and billboards and over the radio and television the warnings about the simple every day fire hazards that cause these tragedies.

That is why we believe so strongly in the teaching of fire safety principles in the appropriate courses of study in every grade of every public and private school, and that is why we believe that every fire department, large and small, paid and volunteer, ought to inspect every home in its community regularly.

•

The Small Fires of 1954

IN this issue of the Quarterly we report on the big fires of 1954. Many NFPA members tell us that this study each year is an important contribution to the science of fire protection.

Some of the smaller fires make mighty interesting reading, too.

Fire alarm sets off fire. Gas escaped from a break in a street main, entered a fire alarm circuit manhole and followed the conduit up to the fire alarm equipment room in the city hall. When the town's fire siren was tested at noon, the gas was ignited and $20,000 damage ensued.

Fire sets off fire alarm. When flames broke through the roof of a wooden building, they short-circuited overhead fire alarm circuit wires of the municipal fire alarm system and turned in the alarm.

Fire turns off water. Fire fighters lost their battle to confine damage to the

building of origin when flames burned overhead electric wires stopping the electric pumps supplying town water mains.

Water starts fire. Spontaneous heating of alfalfa meal moistened by water leaking through a roof destroyed a warehouse.

A bad choice. A woman started to paint the basement walls of her home using a propane gas tank to supply pressure for the spray gun. The ensuing explosion wrecked the dwelling.

One light too many. A janitor struck a match to find the light switch and after turning on the lights threw the match on a cardboard carton and went away. A $75,000 fire resulted.

He fell down stairs. A man fell down stairs while carrying a lighted portable oil heater. The loss was only $1,700 but four people died.

These are but a small sample of the "small loss" fires which appeared in Fire News in the section headed "Recent Important Fires" during last year and all have valuable lessons to offer to those who study fire loss experience.

Fire Protection Developments in 1954

By Percy Bugbee, General Manager,
National Fire Protection Association.

Estimates indicate that fires in 1954 in the U. S. and Canada caused 12,550 deaths, a slight increase over 1953. The largest loss of life occurred in the fire on the aircraft carrier Bennington in May which took a toll of 106 lives. Another loss of life fire that aroused great national interest was the fire that killed 15 children in a one-story school building in Cheektowaga, N. Y. in March. Principal factors here were combustible fibreboard and highly combustible storage without automatic protection.

During the year there were a substantial number of aircraft crash fires. One in South Dakota in August caused 26 deaths and one in New York in December caused a similar number of deaths. The most tragic aircraft loss occurred in Moose Jaw, Saskatchewan, on April 8. Fire following an in-flight collision between a trainer and an airliner caused 37 deaths. An airplane crash fire in Fairchild, Wash. in March caused seven deaths and a property loss of more than $5,000,000. Fifty-four major aircraft fire accidents in the United States and Canada in 1954 cost 240 lives and nearly $70,000,000 in damages.

One of the most tragic dwelling fires of the year, at Parkin, Ark. on Christmas Eve, caused 13 deaths, mostly children. This fire occurred when kerosene was poured on a kitchen stove fire.

Carelessness with portable oil stoves and space heaters exacted a terrific toll of life last winter and appears to be superseding carelessness with smoking and matches as a prime cause of fire deaths.

In this summary a year ago we mentioned the nation-wide interest in fires in nursing homes. During 1954, six fires in nursing homes in Michigan, Texas, Kansas, Maryland, Louisiana and Nova Scotia, caused a total of 32 deaths.

Fire Loss

The preliminary estimate of fire loss throughout the United States and Canada stands at $1,099,500,000. This is slightly higher than the estimate for the previous year. There are close to 2,000,000 outbreaks of fires annually of which 700,000 occur in buildings and the balance are outdoor fires such as forest fires, rubbish and grass fires, and vehicle fires. Final estimates as to the distribution of such fires which are now available for the year 1953 show that of the 727,000 building fires that year 480,000 occurred in residential buildings, 72,000 in mercantile buildings, 37,000 in manufacturing plants, and 15,000 in public buildings. Distribution of causes of these fires indicates that fires due to heating appliances of different kinds were 171,000, fires from smoking and matches 144,000, fires from misuse of and defective electrical appliances and equipment 88,000, fires from needless accumulations of rubbish 54,000, fires from careless handling of flammable liquids 40,000, and fires from lightning 40,000.

During 1954, there were 313 fires with losses exceeding a quarter of a million dollars each and there were 44 fires involving losses of a million dollars or more. The largest monetary losses resulted from the destruction of a large Navy aircraft at Johnsville, Pa. in December with a loss of $9,000,000 and the distilling company fire at Pekin, Ill. in August which killed six persons and involved a property loss of $7,000,000.

Fire Departments

In general, our municipalities continued to be economy-minded during 1954 and this has tended to lead many municipal fire departments to move toward fewer companies, better located and better manned. Cities that have carried out such measures show reduced costs and improved fire services.

The Standards on Motor Fire Apparatus adopted by NFPA, the National Board of Fire Underwriters and the International Association of Fire Chiefs, have had a marked effect on the quality of fire equipment throughout the country and a more general standardization of equipment. An important new development has been the use of the new types of fabrics for fire hose which has brought about less weight and better performance. The NFPA now has a new Committee on Fire Hose studying this development.

Debate on the value of municipal fire alarm systems and the value of combining fire and police departments was fostered by certain students of municipal administration. While these matters were talked about a good deal, there appears to be little interest or desire on the part of the fire service for a different type of fire alarm service and no interest whatsoever in a combined fire and police department.

Firemen's training programs throughout the United States and Canada continue to expand and improve. Our records indicate that for the last year over 125,000 firemen received training through state and provincial programs over and above the training that they receive in their own departments. An encouraging and desirable trend in training is the expansion of these fire training programs to include industrial fire brigade people. No one can successfully deny the value of well trained industrial fire brigades in every important manufacturing plant.

There is a strong trend to more and better activity in fire prevention throughout all of our municipalities. Many new

fire prevention bureaus were established during the year and the idea of a periodical inspection of all dwellings in the community continues to gain ground. I know of no activity carried on by a fire department that will more directly reduce loss of life and at the same time increase the public recognition and prestige of the fire department than dwelling inspections. Everyone is pleased to note that the New York City Fire Department is now engaged in a fire inspection program of very large scope. One of the most unique and most spectacular new types of fire prevention program was conducted by Chief Klinck of the Memphis, Tenn. Fire Department in which he focused city-wide attention on the danger of leaving small children alone at home.

A trend that is, of course, particularly pleasing to NFPA is the provision of NFPA memberships for each fire station throughout the city so that every member of the fire department can have access to regular, up-to-date information on fire protection and fire prevention. Among the fire departments that now have such memberships are Berkeley, Boston, Buffalo, Davenport, Des Moines, Dallas, Houston, Providence and Los Angeles County.

Civil Defense

There is little of substantial progress that we can report when it comes to civil defense. Our government has failed to inform the fire service and other interested services of the potential threat and has also utterly failed to convince the average citizen that civil defense under present-day conditions is of real importance. The public was greatly shocked by the fragmentary news about the H-bomb and its potential destructive properties, but because of a lack of realistic program emanating from Washington has largely adopted a fatalistic attitude that nothing can be done. H-bombs are huge incendiary devices. Whether or not large sections of cities take fire following H-bomb blast will depend very much on whether the back yards are clean and whether any serious attempt has been made to reduce the amount of exposed light, combustible material. Therefore, any measures a city takes to reduce its fire hazards and to clear up its slum areas are of value. Almost every fire chief is anxious to play a part in a civil defense program but all are frustrated because of the lack of planning and direction.

Literature

Very substantial contributions to the technical literature in the field of fire protection appeared during 1954. Some of the newly adopted standards of the widest interest were those on Aircraft Rescue and Fire Fighting, Standard Types of Building Construction, the model Flammable Liquids Ordinance, Standards on Liquefied Petroleum Gas, Municipal Fire Alarm Systems, and Piers and Wharves. During the fall, NFPA published six volumes of National Fire Codes providing a complete and up-to-date set of some 150 different fire codes. The 11th edition of the Handbook of Fire Protection appeared in the spring. This is the most widely used technical reference volume on fire protection in the world today. Other new and important publications were the Industrial Fire Brigades Training Manual and the book on Hospital Fire Safety.

A new service of the Fire Record Department of NFPA has met with a great deal of response and interest. A series of special occupancy fire record studies appeared during the year covering such oc-

cupancies as college dormitories, department stores, farm properties, food canneries, foundries, garages, grocery warehouses, oil piers, and supermarkets.

Fireworks Law

On June 4, President Eisenhower signed H.R. 116, the Church-Wiley Bill which prohibits the shipment of fireworks into any state where they are prohibited by state law. Thus the power of the federal government is at last ranged alongside that of the states which have enacted the NFPA model law.

Education

Substantial progress in the field of fire prevention education was evident during the past year. The Fire Prevention Campaign conducted by the Advertising Council with NFPA as sponsor is without question the most effective mass educational project in fire prevention ever attempted. A nationally known public opinion researcher reported that based on a sample of personal interviews with men and women in various sized communities scattered throughout the United States, 42 per cent of the population were familiar with Sparky, the firehouse Dalmatian that is the symbol of the campaign. Throughout the year messages about the common fire hazards and how to prevent them appeared in large quantity in newspapers, magazines, on billboards and car cards, and over the radio and television. As an adjunct to this campaign, NFPA launched Sparky's Fire Department for children, a development that appears to be of major interest to fire departments and fire prevention committees of local Chambers of Commerce. Thousands of children are learning about fire safety by enrolling as inspectors in Sparky's Fire Department.

Fire Prevention Week in the fall continues to be extremely widely observed throughout the United States and Canada. More than 1600 entries in the Fire Prevention Week Contest were received. Louisville, Ky. and Port Alfred, Quebec, won the Grand Awards in the United States and Canada respectively for the best 1954 municipal Fire Prevention Week programs. Top cities in the U. S., following Louisville, were Philadelphia, Hartford, Memphis, Chicago, Greensboro, N.C., Richland, Wash., Providence, Anderson, Ind., Martinsville, Va., and Killeen, Texas. Top cities in Canada, following Port Alfred, were Kentville, N.S., Calgary, Alberta, Vancouver, B.C., Hull, Que., Ottawa, Ont., Alma, Que., and Brantford, Hamilton and Kitchener, Ont.

I know of no better way to close this article than to quote from a message sent by President Eisenhower to our Association in May 1954:

"Your Association's efforts to minimize the loss of life and property suffered through fires are of great value to the nation, but no one knows better than you how much remains to be done. The deaths in 1953 of some 12,000 people all perishing because of fire attest to the immensity of this task. The property loss from fire damage during the same year of nearly one billion dollars is further testimony to the pressing need for more adequate fire protection.

"Without your continuing campaign for fire prevention, the total would have been significantly greater. I am convinced that such organizations as yours can lead an alert citizenry effectively to combat the threat of fire and reduce its terrible toll."

Large Loss Fires of 1954—Summary

An NFPA Staff Study

In 1954, 313 fires in the United States and Canada caused $202,360,000 loss, about 20 per cent of the total fire waste in the two countries last year. Each of these so-called "large loss" fires caused damages of at least $250,000, 44 with losses of $1,000,000 or more. This experience was the worst in history, the previous high being 302 large loss fires in 1951. In 1953 there were 293 big fires.

The increase in the number of large loss fires was noted particularly in the mercantile classification. There were also record numbers of big fires involving warehouses and transportation as shown in the table below. On the encouraging side of the picture, there was a drop of almost 30 per cent in the number of large loss industrial fires which may possibly indicate an increased awareness on the part of industrial management of the importance of fire safety following the General Motors fire of August 12, 1953.

No. of Large Loss Fires by Years

	1954	1953	1952	1951	1950
Manufacturing	75	105	88	99	83
Storage	54	48	44	50	23
Mercantile	54	29	38	49	29
Transportation	57	39	48	36	31
Residential	11	11	13	8	11
Miscellaneous	62	61	44	60	66
Totals	313	293	275	302	243

In this issue of the QUARTERLY, a detailed analysis of the large loss fires is presented. The analysis has been prepared so that the lessons of these fires may be readily recognized and applied by those responsible for fire prevention and protection. In an effort to present the results of this study in the most useful form, the fires have been grouped into 12 classifications (see Table of Contents) and individually reported. Preceding each of these groups will be found a discussion of the significant factors responsible for the fire experience of that particular occupancy class.

Efforts have been made to obtain accurate information on the 313 fires. These reports are the result of the invaluable co-operation of city and state fire officials, insurance organizations and many individual members.

Geographical Distribution

The 247 large loss fires in buildings included 211 in the United States and 36 in Canada. States with the greatest numbers were New York which had 22, Ohio 14, New Jersey 12, North Carolina 12, Texas 11 and California 10. The 15 fires in Ontario were the most for any Province. Alberta had six.

Significant Features of Building Fires

Certain features responsible for large loss fires in buildings are not related to any special hazard associated with the building occupancy. In the following paragraphs, the effects of these features on the 1954 experience are summarized.

Large Areas

There is a fire protection axiom that large areas and large losses usually go

hand in hand; there is the corollary that large losses can usually be prevented by subdividing large areas of valuable contents, thereby limiting the amount of material that can be damaged by a single fire. Excessively large areas (instances where good fire protection judgment would have recommended subdivision) were factors in 214 of the "large loss" building fires. In most of these cases there was more than one reason why the fires involved whole floors or buildings. Absence of a fire division wall was the most frequent structural weakness permitting excessive horizontal spread (145 instances); open stairways were the most frequent path for vertical flame spread (73 instances). Other frequently recurring structural weaknesses influencing fire spread were open elevator shafts (33), nonfirestopped ceiling spaces (18), nonfirestopped walls (18), large undivided attics (16), substandard fire divisions (12), large undivided basements (6) and lack of cut-offs for special hazard areas (6).

Weaknesses in Private Protection

The importance of providing a reliable watchman or automatic fire detection system to prevent "large loss" fires will be discussed under "Delayed Discovery."

The value of complete sprinkler systems maintained in good operating condition as a means of detecting fires is certainly obvious. Sprinklers, of course, serve the dual function of extinguishing as well as detecting fires and it is a safe assumption that most of the large loss building fires in 1954 would not have occurred had the buildings been completely protected by a properly installed and maintained sprinkler system.

Two hundred and sixteen large loss fires occurred in unsprinklered buildings. In 25 others the buildings were partially or completely sprinklered. If the statement is valid that sprinklers will prevent most large loss fires, how can one account for the 25 large fires in sprinklered properties? The explanation is found in a study of the 25 fires which reflect inadequacies in the protection of individual properties, constituting only exceptions to the general value of sprinkler protection.

Seventeen of the properties were completely sprinklered. In four of them the systems were shut off for repairs or alterations when the fires occurred, in three the water supplies were not adequate to supply all sprinklers that opened, in two cases the systems were shut off before the fires were out, in two the occupancy hazards were too severe for the systems as installed, and in one instance each, sprinklers were ineffective because of explosion damage, a defective dry pipe valve, and a fire in unsprinklered wall spaces of an otherwise sprinklered building. Sprinklers functioned properly in three instances, yet large losses occurred. The large losses were caused by a flash fire that involved a large area before sprinklers opened, an explosion that caused heavy damage to chemical equipment before sprinklers operated, and heavy water damage due to long operation of an unsupervised sprinkler system.

Eight partial sprinkler systems were involved in "large loss" fires. In four instances the fires originated in unsprinklered areas and in one the system was shut off when the fire occurred. Three partial systems held fires in check despite the fact that the fires originated in unsprinklered areas. In these instances hose streams and fire walls helped sprinklers.

Fires that are small when discovered can be put out if there is available the correct type fire extinguisher and someone who knows how to use it. Seventy per cent of the large loss building fires were not discovered until they had spread beyond control. Fire extinguishers would have been of no use in these instances nor would they have been of value where there was explosive or flash fire ignition. However, evidence indicates that certain of the fires would not have reached "large loss" size had the right extinguisher and an employee trained in its use been available. Specifically, there were five instances where an improper type extinguisher was used (e. g. Class A extinguisher on Class B fire), and two fires that could have been readily checked had an extinguisher been available.

It was also noted that there were 15 instances where employees were unable to check the spread of fire because there were no standpipe and hose systems.

In 34 properties where it would have been economically practical to maintain a trained fire brigade, the absence of a brigade was one of the factors permitting the fire to reach "large loss" proportions.

Delayed Discovery

In 174 of the large loss building fires (70 per cent), discovery of the outbreak of fire was seriously delayed. In most of these cases there were neither automatic sprinklers which should have both detected and controlled the fire, nor automatic fire alarm equipment to give warning, nor adequate watchman service.

Why was discovery delayed in these 174 fires? In 168 of the properties there were no automatic sprinklers. Six of the delayed discovery large loss fires occurred in buildings protected by sprinklers. In one a defective dry pipe valve prevented the system from functioning, in three cases the systems were shut off for repairs or alterations and in two the fires originated in unsprinklered areas of partially sprinklered buildings. In 173 cases no automatic fire detection equipment was provided and in the one instance where a system was installed the protection was substandard in that it protected only a small part of the property—not the part where the fire started. In 156 of the properties there were no watchmen; in 18 the watchman service provided was substandard.

Fire Causes

A sure way to prevent a "large loss" fire is to eliminate all possible fire causes. Determination of the cause of a "large loss" fire is often impossible due to the extent of fire at discovery and the degree of destruction at completion. For these reasons the causes of many building fires could not be determined. In other instances there is reason to believe that the cause was not determined because the fire was not carefully investigated.

Of the 111 fires where causes were established, 12 were believed purposely set, 11 were due to wiring faults, nine were caused by welding sparks, seven were set by lightning, careless smoking caused seven, misuse of flammable liquids six, spontaneous ignition of various materials five, and misuse of electrical appliances five.

Editor's Note: A * before a listing of a fire indicates that the fire spread to other buildings. A † after the loss figures indicates that the figure includes an insured business interruption loss.

Major Industrial Fires of 1954

One favorable trend was noted in the 1954 "large loss" fire record—the number of big fires in manufacturing plants tumbled from the 1953 all-time high of 105 to 75 during the last calendar year. While this is small comfort to those who did suffer disastrous fires and no comfort at all to the 19 persons killed during the year in the large industrial fires, the sharp decline is hopefully viewed. The 75 fires reported in this article had losses totalling $36,144,500, also a sharp decline from the $108,770,500 loss of 1953, $45,000,000 of which was assigned to the General Motors fire of August 12, 1953. No loss comparable to this latter disaster occurred during 1954.

It has been noted in previous studies that a majority of the large loss industrial fires are occurring in small and unincorporated towns. The NFPA summary for 1953 showed that 58 of the 105 fires were in towns under 20,000 population or in areas outside city limits. This year, 40 of the 75 were similarly located. This experience shows that more than one out of every two of these large losses are occurring where public protection cannot be expected to meet the requirements of large area industrial properties and where regulations covering building construction, industrial fire hazards, water supplies and fire alarm systems may not be developed to the degree normally found in the bigger cities. Of course, the existence of the most powerful public fire department and the strictest control over building practices cannot guarantee freedom from large fires. In fact, 17 of these major industrial fires occurred in cities of over 100,000 population. This just shows that the proper evaluation of fire safety available in any plant must take into consideration the private fire protection, management and employee interest plus whatever sound technical guidance and assistance may be available from private and public sources.

More large industrial fires occurred during nonoperating periods and during the night than while the plants were in full production. For this reason, delayed fire detection was a frequent handicap to the attempts by fire departments to restrict the amount of fire damage. Of the 75 plants involved, 51 had no automatic protection, 12 had complete automatic sprinkler installations, 4 had partial sprinkler equipment and in the balance (8) automatic protection of conventional types was judged not applicable or details were unavailable.

In three cases (the June 2 fire in a textile plant in Kansas City, the July 29 fire in a chemical plant in Indianapolis and at the newspaper plant in New York, February 5) the sprinklers operated satisfactorily to hold the fires in check. In five cases, water supplies for sprinklers were either shut off during alterations or repairs (April 26 fire in a leather tannery in Johnstown, N. Y. and the wood furniture factory fire in North Wilkesboro, N. C. on August 11) or valves were closed prematurely (the fires at High Point, N. C. on July 13, at Freeport, Texas on Dec. 4 and at Rock Hill, S. C. on Dec 6). Insufficient water supplies were respon-

sible for the failure of sprinklers to control the fires at the textile factory in Portage la Prairie, Manitoba on April 3 and the furniture factory in Brocton, N. Y. on October 4. The hazards inherent in two plants were judged too severe to be adequately controlled by the sprinkler equipment installed (the sawmill at Rapid City, S. D. and the furniture factory in Whitefield, N. H. on July 9 and Sept. 19 respectively). In two additional cases where only partial sprinkler protection was available, the fires originated in the unsprinklered portions and spread into the protected areas to cause extensive damage (fires of March 23 in a sawmill near Canton, Miss. and May 11 at McSherrystown, Pa. in a metalworking plant). In one of the two other cases, a defective dry pipe valve was primarily responsible for one "large loss" at North Attleboro, Mass. (electrical equipment plant). An explosion damaged the sprinklers to render them ineffective at the Leominster, Mass. plastic plant on April 2.

Structural weaknesses played a major role in the 75 big factory fires. In 56 of the fires, the structures themselves were wholly or partially of combustible construction. Insufficient fire divisions were evident in 53 of the fires; in 21 cases the fires spread beyond the building initially involved. In 27 of the 29 fires in multi-storied buildings, more than one floor was involved. Vertical spread was influenced by the lack of enclosures around stairwells or elevator openings in 19 cases.

In 19 cases, flammable liquids influenced the rapid flame spread and in eight cases dusts in suspension increased the speed of flame travel. Explosions before, at the start or during the fire were noted in 12 fires and the extent of the fire at the time fire departments arrived at 29 of these industrial plants forced them to concentrate on protecting exposures before full attention could be given to extinguishment of the property initially involved.

Reliance on the telephone to give the alarm was noted in 59 of the 75 fires. In several cases, delays resulted from bungled instructions or burned wires. Street fire alarm boxes were only used in 8 cases and private boxes in only 2 cases. No watchman service was provided in 26 nonoperating plants and in 5 other plants the watchman service was nonstandard and did not conform to NFPA recommended procedures. In 20 of the plants where it would have been practical to maintain a private fire brigade, none was available.

Brick Works

Oct. 9, Lawrence Twp., Ohio Corundite Refractories, Inc. $476,000

Fire bricks. All combustible parts of the unsprinklered 2-story wooden and brick building (ground floor area 30,000 sq. ft.) were destroyed by fire that originated in one of the 1,000 sq. ft. drying tunnels on the first floor. It is reported that sawdust, which ordinarily burns out of the greenware during kiln drying, leaving the finished product porous, became dry and smoldered. Because of the large amount of greenware in the tunnel a considerable quantity of heat was generated that escaped from one end of the tunnel and ignited adjacent wood building members. Since fire department notification by employees was delayed because of burned telephone wires, since the nearest volunteer departments were six and eight miles away and because water had to be drafted from a pond and a creek, the combustible parts of the building were beyond saving before firemen had streams in operation.

Wide World

Delayed fire detection is especially serious in plants like this one in St. Paul where fire was through the roof when detected at 10:13 P.M., April 14. Flammable liquid storage was involved.

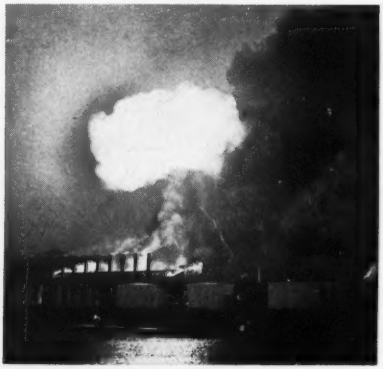
Chemical Plants

April 14, St. Paul, Minn. Sta-Vis Oil Co. $635,000

Packaging motor oil, linseed oil, alcohols. Absence of automatic protection and watchman service permitted fire originating on the fourth story of the 27,000 sq. ft. 2- and 4-story brick, wood-joisted building to spread beyond control before discovery by outsiders at 10:13 P.M., several hours after employees had gone home. Flames and smoke were coming from the fourth story windows and roof when fire was discovered. Spreading down through open stair and elevator shafts and feeding on oily floors and flammable liquid released from tanks, fire soon had control of the entire building.

***June 4, Institute, W. Va. Carbide and Carbon Chemicals Co. $2,000,000**

Acrolein, other organic chemicals. Explosion due to overpressure of a tank car being filled with acrolein injured approximately 15 per cent of the 200 employees on duty and caused widespread damage to adjacent buildings and tankage at the plant and minor damage to property outside the premises.



Two views of the fire that followed the rupture of an acetaldehyde sphere at Institute, W. Va. on June 4. A complete report of this fire was published in the July 1954 NFPA Quarterly and reprints are available for 25 cents each. Effective plant fire brigade and disaster organization planning were demonstrated following this accident.

A detailed report of the accident, including the smooth performance of the plant emergency and mutual aid plans, description of difficulties in controlling ensuing fires and other interesting features, has been published in the July 1954 NFPA QUARTERLY.

July 17, Moundsville, W. Va. Allied Chemical and Dye Corp. $900,000

Solvay process. Details of this fire have not as yet been released.

July 26, South Point, Ohio Allied Chemical & Dye Corp. $750,000†

Nitrogen. Details of this fire have not as yet been released.

July 29, Indianapolis, Ind. Eli Lilly and Co. $1,650,000†

Pharmaceuticals. An uncontrolled chemical reaction in a 500-gallon enclosed reaction kettle caused the kettle to explode. The huge 1-story steel-framed, brick building was severely damaged by the explosion. Released flammable liquids were ignited. Sprinklers operated to cool structural members and equipment and control the fire until extinguished by fire department hose streams and extinguishers. The two men in the building when the explosion occurred were struck by a falling wall but managed to escape.

Sept. 16, Lansing, Mich. Lapaco Chemical Co. $300,000

Following explosion of nicotinic acid dust in a grinding mill on the first floor, fire enveloped the machine and spread with great rapidity through the dusty interior of the unsprinklered 17,500 sq. ft. 2-story wooden building. Foreign metal in the grinding mill was the cause of the explosion. The five employees on the first floor ran outdoors at once and were uninjured. The only employee on the second floor remained inside for 1½ minutes and suffered facial burns before jumping from a second story window. On the advice of the State Health Department, which had on file a list of chemicals at the plant, an area two blocks wide on each side of the fire was evacuated because of the possibility that toxic gases would be evolved. Fire fighters elected to stay on the job and from the windward side wet down exposed tanks of chemicals and prevented spread to adjacent buildings.

The building was undivided except for a storage room which was cut off from the rest of the building by a fire wall. The room and its contents of nicotinic acid, valued at $50,000, was undamaged.

Included in the loss figure reported for this fire is an estimated $150,000 use and occupancy loss. Rebuilding had not been started on December 28.

Sept. 29, Cincinnati, Ohio Emery Industries, Inc. $378,500†

Azelaic and pelargonic acids. An explosion severely damaged the interior of an absorber oxidizer column located in the yard of this plant. Oxygen that discharged from the top of the column was passed through a flame arrestor and an electrostatic precipitator to remove entrained hydrocarbon particles, another flame arrestor and then through other equipment before being reintroduced in the bottom of the column.

At about 3:00 A.M., during a trial run, fire occurred in the electrostatic precipitator, as indicated by a sharp rise in temperature. Ignition of the hydrocarbon-oxygen mixture by an electrostatic spark was the probable cause. Interlocks shut down the process and an employee started to pump the 400 gallons of reaction liquid from the column at 15 gpm. At 3:15 A.M. an explosion occurred in the column that blew out rupture disks on the column and oxygen piping. Blowout of these disks saved the shell, the column and much of the piping. The fire department used hose streams to cool the column.

Dec. 4, Freeport, Texas The Dow Chemical Co. $400,000†

Magnesium by electrolytic decomposition of magnesium chloride. Failure of a coupling on a 4-inch gas line to a gas-fired burner under a decomposition cell was followed by an intense gas fire on the first floor level of the 2- and 3-story mostly noncombustible building. The operator on an upper level immediately left the building to shut off the gas supply to the building but when he could not close this valve, he had to close another valve supplying gas to several buildings. Before the fire brigade and public fire department could put hose streams in operation, fire had spread to part of wood roof deck and monitor. Draft curtains in the partially sprinklered building were credited with limiting lateral spread of fire beneath the roof deck.

***Dec. 6, Barberton, Ohio Columbia-Southern Chemical Corp. $650,000**

Calcium hypochlorite. Three adjoining unsprinklered buildings (total ground floor area approximately 25,000 sq. ft.) were badly damaged by fire that originated at a 100-lb. steel drum of calcium hypochlorite in a building in which 70 tons of calcium hypochlorite in drums and cans were stored. The buildings were constructed of steel framing and asphalt protected steel siding and roofing, coated on both sides. Party walls were substandard (extended only to eaves, numerous small openings) and walls and roofs of buildings were continuous or exposed each other.

On Sept. 16 a serious fire in this chemical plant in Lansing forced neighbors to evacuate the area for two blocks around. An explosion of nicotinic acid in a grinding mill caused the fire which destroyed the 17,500 sq. ft. building.

Since decomposition of calcium hypochlorite with the evolution of heat and oxygen is known to take place in the presence of heat, it is surmised that molten metal or sparks from welding and cutting operations overhead may have dropped on one of the drums and started the decomposition process. Although the fire was confined to one drum when discovered, flames spread quickly to other drums when the loose cover blew off. The large quantities of heat and oxygen released from the decomposing hypochlorite caused an intensive fire so that within five minutes of the start of the fire the entire interior and exterior surfaces of the building of origin had been involved. In a few more minutes, flames had spread over much of the wall and roof surfaces of the exposed buildings. Hose streams used by the private fire brigade and public fire department had little effect on the interior fire until the chemical decomposition process was completed. Thirty minutes after the fire started, it had either been extinguished or had burned itself out. Fire fighting was handicapped by evolution of chlorine.

Dec. 18, New York (Brooklyn) N. Y. Caryl Richards, Inc. $250,000

Hair dyes, lacquers, shampoos, other cosmetics. At 5:16 A.M. firemen were summoned by an outsider for fire in the unsprinklered, 10,000 sq. ft. 2-story factory. No fire was visible when firemen arrived but thick gray smoke was pouring from many of the windows. At 5:27 A.M. fire gases in the building exploded and the basement and first story were rapidly enveloped in flames.

The fire is believed to have originated in the not-cut-off furnace room in the basement and to have spread to combustible packaging materials in adjacent storerooms. Lack of sprinklers, detection and watchman protection, and the presence of many unprotected openings between floors accounted for the extensive damage. The fire was confined to the building of origin by 14 engine streams and three deck pipe streams.

Fertilizer Plants

***Feb. 21, Grindstone, Magdalen Islands, Que. Canapro Ltd., et al. $310,000**

Fish meal and fish oil. A month before the start of the annual herring season, fire destroyed the only processing plant available to handle the catch of the local fishermen. Short circuit of overhead 440-volt wiring is a possible cause of the fire that broke out in the wood roof of the undivided and unsprinklered 7,174 sq. ft. 1-story masonry, wood-joisted building. A severely exposed wooden warehouse was also destroyed.

The fire was discovered by an outsider at 3:45 A.M. Despite the delayed discovery, investigators are of the opinion that severe damage could have been confined to the wooden roof had not 10,000 gallons of fuel oil flowed into the building when a roof member fell and loosened a coupling on a 2-inch exposed pipe near the floor. When the plant was in operation, oil flowed by gravity through this pipe from an outdoor aboveground storage tank to several oil-fired processing units in the building. The valve at the tank had been closed for several months. How it happened to be open at the time of the fire has not been explained.

April 8, near Pensacola, Fla. Merchants Fertilizer and Phosphate Co. of Pensacola, Inc. $322,500

Dry mixing phosphate, superphosphate, potassium chloride, inert filler. When fire breaks out in a large, undivided wooden building, it is vitally important that the fire be discovered and extinguished promptly if the building is to be saved. When fire broke out during the night in this undivided 64,928 sq. ft. 1-story wooden building, there was no watchman or automatic protection on hand and consequently the fire was not discovered until it was seen coming from the roof at one end of the building by an outsider at 12:15 A.M. Upon arrival of the first of six engine companies from surrounding towns and military establishments, it was apparent that the fire in the fertilizer factory was beyond control.

Fireworks

July 16, Chestertown, Md. Kent Mfg. Co. $327,500; 11 killed

Fireworks, fuses. Eleven employees were killed, 50 were injured and more than 30 buildings at the plant were destroyed by fires and explosions that followed an initial explosion in the final assembly building. The first explosion is believed to have originated in a drying oven and one report gives

United Press

Eleven employees were killed and 50 injured in this Chestertown, Md. plant which made fireworks. The initial explosion occurred in the final assembly building and subsequent explosions and fires destroyed 30 buildings on the plant grounds.

a broken light bulb as a possible ignition source. Fires broke out in many of the small buildings at the plant site but because of repeated explosions, fire fighting was delayed 30 minutes. During this time, firemen showed great courage in wetting down several uninvolved exposures. Because of the nearness of the plant to a built-up section of the town, many buildings outside the plant suffered explosion damage.

Food and Food Products

Animal Feeds

May 19, Waukegan, Ill. Blatchford Calf Meal Co. $250,000

Animal food processing plant. At 8:01 P.M., two hours after the mill had closed for the night, a passerby discovered fire in the 3-story section of the 1-, 2- and 3-story mill and warehouse. The fire originated on the first floor and had made considerable headway by the time firemen were notified. As the fire spread rapidly up an open stairway and other unprotected openings in the 3-story section, several dust explosions occurred. Automatic closing of metalclad doors in the wall between the 3- and 2-story sections was the principal reason that the fire was prevented from spreading to the latter section. Firemen used ladder pipes, deluge sets and ten 2½-inch hose streams to protect four other buildings and two silos. The buildings were unsprinklered, had no automatic fire detection equipment and the watchman had been dismissed 60 days prior to the fire. The fire may have been caused by spontaneous heating of fish-oil-soaked rags left in a wooden container.

***July 31, Louisville, Ky. Aubrey Feed Mills, Inc. $1,044,000**

Feed mill and warehouse, two elevators. The 3-story brick, plank-on-timber feed mill, two wood-framed metalclad elevators and a feed warehouse, all unsprinklered and interconnected by unprotected doorways or passageways, were destroyed by fire that originated in the headhouse of one of the elevators while employees were at lunch. It is believed that the unattended elevator

choked, and that since no automatic shutdown device was provided, friction of a pulley against a belt or an overheated motor caused the fire to break out. The blaze was beyond control when discovered by the watchman at 1:20 A.M., 15 minutes after he passed by the point of origin. Fire had spread through the building of origin and to adjoining and adjacent exposed buildings via unprotected openings by the time firemen arrived. Insufficient hydrants near the fire delayed fire fighting.

Oct. 25, Voorheesville, N. Y., O. B. Vunck & Son $272,000

Cattle, dog and poultry feeds. "There was no question of saving the mill by the time we got there. Our job was to prevent the spread of the fire to other buildings in this area." This statement by the Voorheesville fire chief to explain why his department could not save the 17,500 sq. ft. 3-story wooden mill should be supplemented by a few facts to explain why the fire should reach such a magnitude before discovery. The building was not sprinklered, had no watchman or automatic fire detection equipment, and was undivided. The fire was reported at 11:20 P.M. On Oct. 12, 1934 the mill's predecessor had been leveled by fire.

Dec. 20, Los Angeles, Calif. Lewis Food, Inc. $300,000

Dog and cat food. A gas explosion in a vent from one of the 116-ft.-long conveyor-type ovens in the building preceded fire that broke out at ceiling level in the vicinity of the vent. Had the building been sprinklered or had the fire department been called at once it is probable that the fire would have been controlled with minor damages. On discovering the fire, employees discharged several fire extinguishers without effect before calling the fire department. This delay allowed the fire to involve shortening oil, flour dust and waxed paper, and to spread rapidly through the undivided 172 ft. by 96 ft. 1-story masonry, wood-joisted building.

Canneries

April 28, Sunnyside, Wash. Varney's Sunnyside Canning Co. $408,000

Canned fruit, vegetables, frozen asparagus. Delayed detection (estimated at 4 hours), lack of automatic protection, 1.5 acres of undivided building, blank walls and high-piled stock combined to result in the total destruction of this 1- and 2-story cannery of mixed construction (46 per cent wood, 45 per cent hollow concrete, 9 per cent reinforced concrete). When discovered by an outsider at 9:40 P.M., fire involved a considerable portion of the roof. Burning brands driven by a brisk wind threatened exposed buildings, but householders protected their property with wet sacks and garden hose streams. In spite of the extent of the blaze on arrival and the fire fighting handicaps, firemen effectively protected exposures including a tank farm and had the fire under control in 1½ hours. Although the extent of damage prevented any definite theories on the cause, it was apparent that the fire originated near or on a work bench (possibly from oily rags) in a shop area.

***July 22, Ceepeecee, B. C. Nelson Brothers Fisheries, Ltd. $445,000**

Fish cannery, 3 dwellings, store. Fire that destroyed this large fish cannery broke out during the off-season and may have been caused by sparks from a welding torch that had been used in the plant earlier in the day. When the caretaker was awakened by the flames at 4:00 A.M., fire had made so much headway that he immediately warned occupants of three adjacent dwellings to flee. The unsprinklered and undivided 1-story combustible cannery was destroyed as well as the three dwellings and a combination store and post office. By the time fire fighters reached the scene, the fire had gained such headway that efforts were concentrated on keeping flames from near-by aboveground storage tanks containing 140,000 gallons of gasoline and fuel oil.

Dec. 7, Trafalgar, Ind. Kenneth N. Rider Co., Inc. $290,000

Bean, tomato canning. An overheated stoker-fed furnace located in the open in a warehouse section of the 22,000 sq. ft. rambling 1-story wooden building was the probable cause of fire that destroyed all but the tomato canning section. Because of low temperatures, a plant superintendent had gone to the building at 9:30 P.M. December 6, filled all stokers, and then left. A passer-by at 1:30 A.M., December 7, saw nothing wrong but at 3:00 A.M. a neighbor was

awakened by the noise of exploding cans. Firemen found the unsprinklered building heavily involved and, because of the crowded condition in the storage section, had to conduct fire fighting from outside. Using water drafted from a cistern and from a pond, they were able to check the flames before the tomato canning section was involved.

Fruit Packing

***May 24, Del Rey, Calif. Enoch Packing Co., et al. $1,063,500**

Raisin dehydrating, packing. Yard storage reduced the effectiveness of open spaces as fire barriers between buildings sufficiently to permit fire that originated in a raisin warehouse to involve two groups of combustible buildings. Other factors were lack of automatic or watchman protection, lack of water mains and hydrants, and a 30 mph wind. The fire was beyond control in the 1-story 30,000 sq. ft. building of origin when discovered by an outsider at 8:30 P.M. and was spreading so rapidly to other buildings through yard storage when firemen arrived that help from neighboring towns was immediately summoned. Drafting from an irrigation ditch, firemen eventually had ten hose streams in operation which were used effectively to save the main building of a neighboring raisin packing plant.

Ice Cream

Feb. 11, Long Island City, N. Y. National Dairy Products Corp. $276,000

Ice cream. In connection with enlargement of cold room facilities at this plant, a cold room was being constructed on the first floor of the 3-story reinforced concrete building. A flash fire occurred in this area shortly after a low flash point primer had been brushed on the floor prior to the application of cork insulation. Ignition of solvent vapors from the primer by an acetylene cutting torch being used near by was the probable cause of the fire. Flames, accompanied by dense smoke, spread so rapidly over cork insulation and temporary plywood partitions that employees were not able to make good use of fire extinguishers. Using several hose streams, firemen were able to confine the fire to the first floor of the 3-story fire-resistive building. However, heat caused severe damage to the second story floor slab and also melted 14,000 gallons of the 64,000 gallons of ice cream in the building.

Poultry Processing

Dec. 23, Calgary, Alta. Sam Sheinin, et al. $475,000

Poultry and poultry products processing, storage, meat cold storage. Lack of sprinkler protection, frequently recommended, allowed fire that originated during the night to involve all of the 32,000 sq. ft. poultry processing and storage section of the 1-story building before it was discovered by a passerby at 10:57 P.M. Fire spread through a break in a brick wall at roof level to a small area of the insulated roof of the adjoining meat storage section. The roof had to be opened up to extinguish the fire and it was necessary to open the cold storage section to be sure that fire had not spread into the interior. Although fire did not enter the meat storage area, smoke and water damage to the contents was heavy.

Leather Working

***April 26, Johnstown, N. Y. Filmer Leather Co., Inc. $368,500**

Upper shoe, garment and glove leathers. Twenty-four hours after fire in the blind attic of a 1-story office addition was extinguished by one sprinkler, a second fire occurred, this one on the third story. The second fire destroyed the sprinklered 3-story wooden building and nine near-by unsprinklered 1- and 2-story buildings.

After the first fire, the owner of the plant decided to comply with previous requests to replace old sprinklers in the first and second stories with new ones. This necessitated shut-down of the entire sprinkler system since there were no sectional control valves. Consequently, when the second fire occurred, the system was inoperative, several old sprinklers had been removed and drain valves had been opened. The main control valve was turned on as soon as the fire was reported but too many openings in the piping on the two lower stories in combination with normally weak water supplies prevented water from reaching fused heads in the third story. Firemen experienced considerable difficulty getting water from a creek since hair from an upstream hair washing plant clogged suction pipes repeatedly. The second fire originated from an overheated fan bearing on an exhaust system used to remove overspray from a new leather finishing process.

Dec. 16, Passaic, N. J. Hobby Footwear, Inc. $250,000†

Slippers, shoes. At 7:00 A.M., the plant watchman, as was his custom, turned on three electrically heated glue pots so that the glue would be ready for use when workers reported. Apparently the heat ignited glue residues inside exhaust pipes from the glue pots, since a few minutes later the watchman noticed that the exhaust pipes were red hot. Fire was coming from the roof in the vicinity of the exhaust stack and was spreading through combustible stock on the balcony of the unsprinklered 8,000 sq. ft. 1-story brick, wood-joisted building when fire fighters arrived.

Metalworking

Electrical Appliances, Equipment

Feb. 15, Emeryville, Calif. Tecumseh Products Co. $304,000

Rebuilding, servicing refrigeration units. An electric hot plate that had been left turned on in the girls' rest room ignited the wooden table on which it rested. Ignition occurred after the 33,000 sq. ft., 1-story brick, steel-framed building had been locked up for the night. Since the building had no automatic protection or watchman service, the fire was not discovered until it had broken through the roof. It was then seen by employees in a near-by plant. There was not much for fire fighters to do by then, however, but to protect exposures since flames had spread through most of the undivided 30,000 sq. ft. interior. Collapse of unprotected steel columns and trusses pulled brick walls out of plumb. Combustible materials contributing to fire spread included plywood interior partitions, paper containers, and a recent delivery of lacquer, paint and thinner that was stacked inside the delivery door when the fire occurred.

***March 11, North Attleboro, Mass. Barber Electric Mfg. Co., Inc., et al. $250,000**

Electric switches. At 1:20 A.M. neighbors noticed flames coming from the roof of this

United Press Photo

It was 1:20 A.M. when neighbors noticed flames coming from the roof of Barber Electric Manufacturing plant in North Attleboro, Mass. on the morning of March 11. A defective dry pipe valve (1917 model) was responsible for failure of the sprinkler system to control the fire.

sprinklered 4-story wooden building and gave the alarm. Fire fighters found one outside wall and the stair and elevator well in flames, and the fire was spreading rapidly through all stories. Intense heat hampered firemen and at one time when they were temporarily forced back by the heat, fire spread to and enveloped the interior of an unsprinklered 1-story brick, wood-joisted foundry 45 feet away.

Two questions in everyone's mind concerned the origin of the fire and the failure of the sprinkler system to operate. Although the extent of fire on discovery prevented definite conclusions as to the cause of fire, investigators are of the opinion that it originated in packing cases on a loading platform and spread up wooden clapboards under asbestos shingles. On entering the building it spread through the stair and elevator well. Recovery of the dry pipe valve from the debris in the "set" condition left no doubt that failure of sprinklers to operate was due to a defective dry pipe valve. The valve in question was an old model (1917) that had given trouble at other locations and its replacement had been repeatedly recommended by insurance inspectors.

June 8, Hopkins, Minn. Ryan Industries, Inc. $275,000

Home freezers. Fire caused by an overflowing tar kettle could probably have been confined to a small part of the unsprinklered and undivided 16,000 sq. ft. 1-story building had the Hopkins Fire Department been called at once. The alarm was delayed several minutes until it was evident that employees could not control the fire, after which the superintendent dialed "Operator" and asked for the Fire Department. He was connected with the Minneapolis Fire Department at 11:41 A.M. The call was transferred to the Wayzata Fire Department at 11:51 A.M., after which it was relayed to the Hopkins Fire Department at 11:55 A.M. During this time, the fire was spreading throughout the undivided building by means of the combustible fibreboard ceiling. Most all records were lost as safes and vaults were left open.

Oct. 9, Marion, Ill. Sangamo Electric Co. $330,000†

Electric capacitors. Shortly before production operations were to start in this recently acquired building, it was destroyed by fire. Two features of the fire protection were particularly regrettable: first, the failure of the watchman to notify the fire department when smoke was first smelled, and second, interruption of sprinkler system installation because of a jurisdictional labor dispute. The only part of the installation not completed when the fire occurred was the connection to the underground main.

While on his 5:00 P.M. round on Oct. 8 the watchman noted a peculiar odor. He and the maintenance man checked the premises and on finding nothing out of order did not call the plant or municipal fire departments. Twelve hours later the odor was so strong that the fire departments were called. Before their arrival, fire was spreading rapidly through the 8,600 sq. ft. 1-story asbestos-protected, metal-on-wood frame building.

Foundry

June 11, Weathersfield Twp., Ohio Sharon Steel Corp. et al. $575,000,† 4 killed

Titanium casting. While a 2,200 lb. ingot was being cast in a titanium remelt electric arc furnace, two violent explosions occurred that inflicted fatal burns on four employees and severely damaged the 7,632 sq. ft., high 1-story noncombustible building. Entrance of water from the cooling jacket into the crucible of molten titanium was believed responsible for the explosion. The first violent explosion ruptured the crucible and water jacket and ejected a cloud of burning hydrogen, molten metal and debris. The hydrogen resembled a ball of flame as it flashed up stairways and through floor gratings to upper levels of the high building. The casualties are believed to have been caused by this explosion. The second violent explosion, immediately after the first, occurred when the crucible fell and spilled molten metal and water on the floor. Hydrogen generated by the reaction of water and molten titanium formed an explosive mixture with air that was ignited by hot metal. Small scattered fires were extinguished by the fire department using hose streams and soda-acid extinguishers.

Metal Plating

March 25, Broadview, Ill. Hub Plating Co. $850,000

Forming and chrome-plating furniture legs. Fire that destroyed this undivided

Two Quonset huts, each 384 feet long and 82 feet wide, lined with combustible fibreboard, were destroyed in Springettsburg Township, Pa. on June 15 by a fire discovered by a watchman at 2:00 A.M. The alarm transmission was delayed as the watchman became excited and did not use the phone properly.

206 ft. by 239 ft. 1-story brick, wood-joisted building originated in an unoccupied locker room. The plant was in full operation when the fire broke out but since no automatic protection or watchman service was provided it was not promptly discovered. The fire might still have been confined to the locker room had the fire department been called at once. Instead, the alarm was delayed ten minutes as employees elected to try to put out the blaze with soda-acid extinguishers. The fire was too big to be controlled by this type of equipment but, in the opinion of the fire chief, might have been held in check had standpipe hoses been available. When fire fighters arrived, flames were spreading along the undersurface of the wood roof deck and were involving wooden partitions.

Steel Fabricating

April 23, Wilkes-Barre, Pa. Walter C. Williams Co., et al. $475,000

Metal locker fabrication, industrial equipment sales. This unsprinklered 2-story masonry, wood-joisted building was destroyed by fire that originated on or under a loading platform. Feeding on oil-soaked metal filings and debris around the loading platform, the fire apparently made considerable headway before discovery by an employee at 3:31 A.M. On entering the building via open doors, flames burned rapidly along oily floors and ceilings of the 80,000 sq. ft. first story and spread to the second story via open stairways. The fire department reported that improperly stored flammable liquids contributed to the spread of fire but did not give further details.

June 15, Springettsburg Township, Pa. York-Shipley, Inc. $500,000

Boilers, furnaces. The two Quonset-type buildings destroyed in this fire were each 384 ft. by 82 ft., of all-metal construction, and with interior finish of combustible fibreboard. They were parallel to each other, 11 feet apart but connected at one end by a passageway. The fire originated on top of a high pile of boiler insulation wrapped in waterproof paper. Ignition of the paper by heat from three 500 watt bulbs directly above the pile was the probable cause.

When the watchman discovered the fire on his 2 A.M. round, it was apparently still confined to the top of the pile. However, because of the absence of sprinklers, delayed

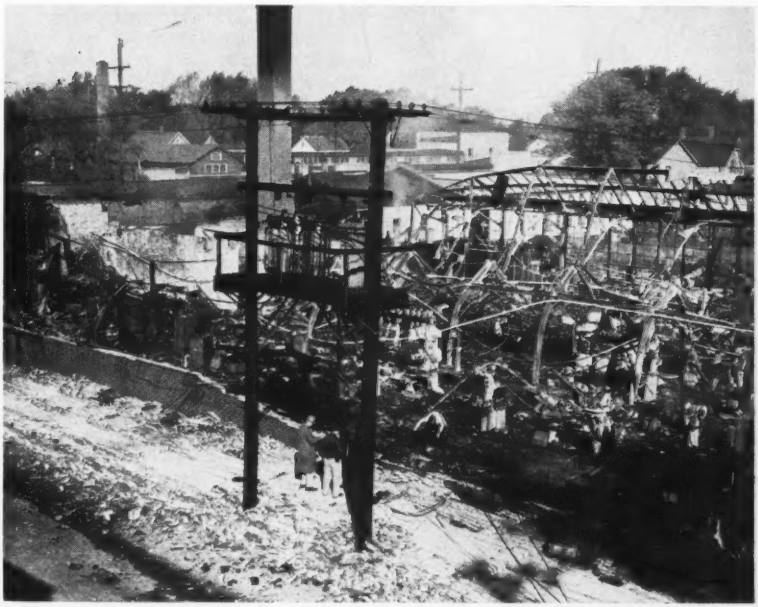
fire department notification and the presence of the combustible interior finish, the fire spread beyond control in the building of origin before the first fire company arrived. While the watchman tried to telephone the alarm to three different fire departments (in his excitement he hung up before his call was answered in the first two instances), flames entered the concealed space behind the fibreboard and spread through this space. Flames went through the passageway to the adjacent building as firemen struggled to get water on the fire.

July 1, Anderson, Ind. Ajay Screw Machine Products Co. $316,500

Idle metalworker with some experimental work in process. The owner left this 14,000 sq. ft. unsprinklered, brick-joisted and hollow concrete machine shop 13 hours before fire was discovered by outsiders. The plant had been idle since January after completion of governmental contracts but all machinery and equipment was left in the building and some research work was being conducted by the owner. The fire apparently originated in the attic space where large amounts of combustible materials were stored and got a tremendous head start before the chance 12:56 A.M. detection. Fire fighters summoned by telephone turned in second and third alarms within minutes after their arrival to secure the needed hose streams. Ten large automatic screw machines, electric welding equipment, degreasing tanks, paint spraying equipment and thousands of dollars worth of other valuable equipment were lost.

Oct. 19, Bradley, Ill. Manco Mfg. Co., Inc. $350,000

Heavy hardware, machine tools. At 10:15 P.M. the night janitor discovered fire that originated in the not-cut-off boiler room of the unsprinklered 30,000 sq. ft. 1-story building constructed of masonry walls and wood-joist on steel truss roof. The fire was so intense that he had to leave the building to telephone the alarm and when firemen



Just a simple fire door between a boiler room and the balance of this 30,000 sq. ft. Bradley, Ill. metalworking plant might well have prevented the Oct. 19, $350,000 loss.

arrived a few minutes later most of the interior of the undivided building was involved. Proper operation of fire doors at fire wall openings prevented spread to the adjoining warehouse.

***Nov. 12, New Glasgow, N. S., I. Matheson Co., Ltd. $402,500**

Boilers, tanks. Five adjoining unsprinklered buildings of mixed construction were destroyed by fire that originated in the 1-story wood-frame, metalclad building known as the welding shop. The fire originated at an acetylene cylinder and was later determined to have been caused by acetylene leaking from around threads at the valve connection. The ignition source was a motor on the electric welding equipment. Employees discovered the fire at once and could probably have confined the fire to the area of origin had extinguishers and standpipe hoses been available. Before the arrival of the town's two fire trucks, manned only by the drivers, an oxygen cylinder had exploded and fire had ignited the eaves. Water from the hydrant-connected hose lines could not reach the eaves. Other hydrant-connected hoses that were later placed in operation had no appreciable effect on the flames that spread from one to another of the connected buildings because of unprotected openings in masonry division walls and substandard walls that did not extend through the roofs.

Mining

Feb. 9, Lucernemines, Pa. Rochester & Pittsburgh Coal Co. $500,000; 3 killed

Bituminous coal-cleaning plant. Three men were killed, four were injured, coal drying equipment and the steel-framed, metalclad coal-cleaning building were extensively damaged by an explosion of coal dust. The ensuing fire spread through much of the 180 ft. by 116 ft. by 97 ft.-high building. Investigators concluded that the explosion originated somewhere in the fine coal drying, dust collecting, and dust disposal system. Because of the many possible sources of ignition present, it was impossible to pinpoint more closely the point of ignition. The investigators recommended specifically several provisions of the NFPA Code for the Prevention of Dust Explosions in Coal Pneumatic Cleaning Plants that should be followed in rebuilding the plant.

April 26, near Bathurst, N. B. Keymet Mines, Ltd. $250,000

Lead and zinc mining and refining. In the rush to get a new mine in production at a recently discovered, very promising deposit, all construction features were given higher priority than fire protection. Fire safety had not advanced beyond the planning phase when this fire occurred, a month before the mine was to go into full production. Sparks from an acetylene welding torch were the reported cause. The blaze started during the lunch hour and spread undetected through the mine surface buildings because of lack of automatic protection, a private fire brigade and a water supply for fire fighting. When the plant was rebuilt, many of the original fire protection recommendations advanced by the Provincial Fire Marshal's office were adopted.

Sept. 7, Yancey, Ky. Harlan Fuel Co., Inc. $400,000

Coal tipple. The need for watchman service, automatic protection, a trained fire brigade and a system of yard hydrants with a good water supply was demonstrated by the fire that destroyed this steel-framed, metalclad coal tipple. When discovered by a neighbor at 1:00 A.M. the fire was beyond control, having spread through unprotected openings. A heavy accumulation of bituminous coal dust which was known to be present undoubtedly contributed to the rapid spread of fire. The Harlan firemen who responded took suction with their pumper from a near-by creek and protected exposures.

A $510,000 fire at this same mining site on January 8, 1953 (see January 1954 NFPA QUARTERLY) was discovered promptly by employees, but because of oily coal dust spread rapidly beyond control.

***Oct. 22, near Sleitmute, Alaska DeCoursey Mining Co. $300,000**

Mercury ore mining and refining. Ignition of a wooden wall of the hoist house by an overheated stove was the probable cause of fire that destroyed the entire group of congested combustible buildings housing the machine shop, power plant and reduction plant. With no water available for fire fighting, employees made a futile attempt to control the Class A fire with eight extinguishers suitable for Class B or C fires.

Bill Preston, The Nashville Tennessean

This large area multiple occupancy manufacturing plant was located outside the fire protection limits of Nashville and fire department response on Mar. 25 was delayed for lack of a contract with the city.

Multiple Occupancy Manufacturing

March 25, near Nashville, Tenn. Rollins Associates, Inc., et al. $420,000

Trailer sales, service, farm equipment storage; metal stamping; wire products. While workmen were repairing the metal roof of the 1-story mostly noncombustible, steel-trussed building, welding sparks fell into an open container of paint in a paint dipping section. Several factors then combined to cause destruction of most of the large-area building and its contents. The building was unsprinklered, the paint dipping area was not cut off. There were unprotected openings in masonry walls between occupants. Fire department response from Nashville was delayed until the building owner would agree to pay for this service. The only water supply was from a hydrant 1,000 ft. away at a fairground.

May 11, McSherrystown, Pa. Emeco Corp., et al. $300,000

Metal chair frames, shoes. Two of a group of interconnected sprinklered 1-story wooden and wood-framed, metalclad buildings were destroyed by fire that originated on an 80 ft. by 25 ft. roofed-over platform between the two buildings. This unsprinklered platform (sprinklers had been recommended) was used to cut steel tubing into proper lengths and was also a temporary storage place for cartons of scrap foam rubber. The scrap rubber came from the upholstery department in another building. The fire originated in the cartons of scrap rubber and was believed caused by sparks from the power saw that was used to cut steel tubing.

Flames jumped to the under side of the platform roof and as employees attacked the Class A fire with several 15-lb. Class B, C extinguishers, flames entered the adjoining metalclad building through boarded-over windows. Fire soon overpowered the sprinkler system because of the weak water supply. At about this time, employees completed laying a 2½-inch hose from a yard hydrant 80 ft. away only to find that sprinklers were taking all water. Fire also spread from the platform into the communicating wooden section where sprinklers were of no value because of the already depleted water supply. Confronted with a fire involving the platform and the two communicating buildings, the fire department that responded did commendable work in saving the rest of the group. Four hose streams were obtained from town hydrants and two from a quarry a half mile away.

July 15, New York (Brooklyn), N. Y. Washington Corrugated Box Co., et al. $500,000

Corrugated boxes, hat dying, metal plating, hair nets, coats, surgical instruments, wood products. Originating in an area of the first floor occupied by the box manufac-

Wide World

In this Brooklyn, N. Y. factory on July 15, fire spread through concealed wall and ceiling spaces from the first floor.

turing firm, fire spread throughout the building, traveling laterally in concealed ceiling spaces and vertically within non-firestopped walls and by means of windows to all parts of the unsprinklered 30,000 sq. ft. 5-story brick, plank and timber building. The fire had made considerable headway when discovered by two of the handful of employees still in the building and eventually broke through the roof.

Paint and Varnish

Jan. 30, Chicago, Ill., Interchemical Corp. $300,000†

Varnish. When glacial acetic acid was added to a cooking batch of varnish to neutralize excess lime, the batch boiled up and overflowed the kettle through an open charging hole. Before an employee could shut off an adjacent gas burner, flammable vapors ignited explosively. Hinged windows in the third story cook room and adjoining kettle room were blown open, the overflowing varnish ignited and fire spread with great rapidity through exhaust ducts to the vapor condenser and recovery unit on the roof of the 3-story, fire-resistive building.

As soon as all employees were safely out of the cook and kettle rooms, four local application and two total flooding carbon dioxide systems were operated manually.

Wide World

An explosion of acetone vapors preceded the fire that destroyed a sprinklered 3-story building housing a Leominster, Mass. plastics fabricating plant and other manufacturers. Six near-by dwellings were also destroyed.

Operation of the total flooding systems simultaneously closed all fire doors leading from the two rooms and then doors were kept closed until firemen with charged lines were on hand. The manually operated closed head sprinkler system in these two rooms was also operated. Fire in these rooms was practically extinguished by the carbon dioxide and water from 21 sprinklers when firemen opened the doors. Fire in the condenser unit on the roof was controlled by the private fire brigade using a 1½-inch standpipe hose and by the public fire department using three 2½-inch lines.

Plastics Fabricating

***April 2, Leominster, Mass. Castle Novelty Co., et al. $250,000**

Plastic novelties, plastic buttons, wood furniture, print shop, six dwellings. At 12:15 P.M., when most of the people employed in the sprinklered 3-story brick, wood-joisted building were home for lunch, an explosion occurred in the second story that blew out part of one wall of the U-shaped building. Three employees eating their lunch in the third story barely escaped from the building before flames enveloped the interior. The upper two floors were well involved when the first fire engine company arrived. Before strong fire fighting forces could be mobilized, winds (gusts up to 60 mph) carried the fire to six wooden dwellings, one of which was 36 in. from the factory. Investigation by the state fire marshal's office determined that the explosion originated in a room where acetone was kept and that the explosion had occurred when acetone vapors were ignited by an electric hot plate. From this explanation, it can be concluded that the sprinkler system was damaged by the explosion accounting for its inability to control the ensuing fire. The sprinkler protection was known to depend on an inadequate single source supply from a 6-inch main through a 4-inch corroded connection.

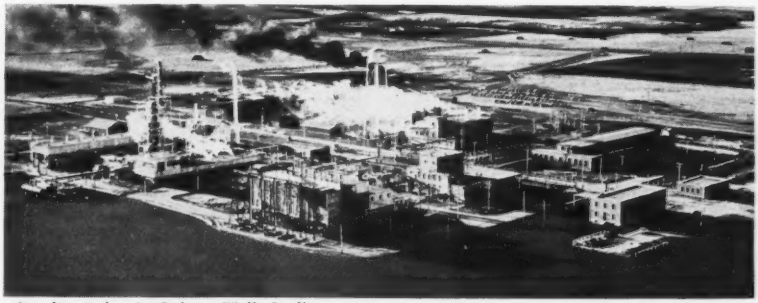
Dec. 15, Dixon, Ill. Kavanagh Plastic Co., et al. $535,000

Plastic novelties, valves. Fire that destroyed this 22,400 sq. ft. 2-story brick, wood-joisted building was burning in both stories of that part of the building occupied by the plastics fabricator when discovered by a freight train crew at 1:04 A.M. The merchant policeman on his 2-hourly rounds punched his clock in the building 30 minutes earlier, at which time everything appeared to be in order. The fire originated in cartons of scrap cellular polystyrene plastic or in a bin of the chopped plastic. Combustible fibreboard walls, two open stairwells and two other large unprotected openings helped the fire spread through the 2-story section. On breaking through the roof, fire spread over the top of the unparapeted brick wall that separated the two occupancies in the building.

Plastics Manufacturing

***Feb. 4, Newhall, Calif., Loven Chemical of California $330,000**

Phenol resin plastic molding powder. The unsprinklered 10,450 sq. ft., 1-story, wood-



Canadian Industries Ltd. — Wells Studios

Static spark ignition of ethylene gas was the probable cause of the explosion at this Edmonton, Alberta, plastics manufacturing plant on March 4.

frame, metalclad resin processing building was destroyed and the composition-on-wood roof of the 1-story drying shed 20 ft. away was damaged by fire discovered by the watchman at 1:04 A.M. When first noticed, the fire was seen coming from under a wooden partition near the boiler. After using a 2½-gallon extinguisher on the fire without effect (a standpipe hose was available but was not used), the watchman called the fire department. Firemen were on the scene within two minutes but during this time fire had spread with great speed through resin dust on the floor and in exhaust ducts from grinding equipment and had involved most of the undivided building. Firemen were successful in saving the seriously exposed drying shed. Although the cause of the fire was not determined, it was suspected that sparks from a buffing machine being used by the watchman to clean a vat may have ignited dust that had accumulated on the floor.

Mar. 4, Edmonton, Alta. Canadian Industries Ltd. $250,000

Polyethylene. Three of a row of eight enclosures in which ethylene gas is converted to polyethylene under very high pressures were damaged when ethylene, leaking from a defective pipe, accumulated in one of the enclosures and exploded. Since it has been demonstrated that static can ignite ethylene gas escaping at low velocity, ignition by static is a possibility in this instance.

Each of the eight enclosures in the row was 15 ft. wide, 20 ft. deep and 50 ft. high. The continuous back wall (which separated the enclosures from the rest of the plant) and the side walls were 15-inch-thick concrete. The roof was concrete on steel. Lightweight blow-out panels were installed on the front side of the enclosures as explosion vents. The explosion bulged the back wall for about 20 ft. of its length, damaged three side walls and blew out the blow-out panels on the eight enclosures.

Printing Plants

Jan. 22, Montreal, Que. Taylor Advertising, Inc. $300,000

Printing. Fire originating in the basement of the unsprinklered 3-story brick, wood-joisted building was too big to be controlled by first-aid extinguishers when discovered

Fire shown coming from second story windows of this Montreal printing plant originated in the basement while people were in the building.

by employees and soon spread through unprotected vertical openings to all stories. Fortunately the three occupants who were forced to use a fire escape to get out were not confronted with the conditions shown when the accompanying picture was taken. The photo is a graphic illustration of one reason why fire escape stairs are not recommended as a means of emergency exit in the NFPA Building Exits Code.

Feb. 5, New York (Manhattan), N. Y. News Syndicate Co., Inc. $300,000

Newspaper printing. Fire originating at a 4 ft. by 6 ft. metal duct used for ventilating the third story pressroom, entered the duct and spread to the fan house on the roof of the 9-story annex to a 37-story fire-resistive building. The duct ran horizontally

United Press

New York newspaper plant fire, Feb. 5.

130 ft. beneath the pressroom ceiling before going vertically through all higher floors to the roof. The fire appears to have originated in a 4-in.-deep space between the bottom of the duct and combustible fibreboard (treated to make it flame resistant) that had been placed on the bottom and one side of the duct. Apparently oil, ink and cleaning liquids had accumulated in the duct and leaked through to saturate the fibreboard. Heat from one of several electric outlets that extended through the fibreboard and that supported fixtures with enclosed 300-watt bulbs was a possible ignition source.

When first seen, flames were burning on the bottom of the duct. Smoke rapidly filled the pressroom forcing employees to flee. (Newspapers report that 24 pressroom employees, blinded by smoke, were led down aerial ladders to safety.) Fire also spread to the ceiling and windows of the pressroom (only a small part of which was sprinklered) and ignited some press rollers on the floor near the duct. The presses themselves were not endangered by the heat and, although wet down by hose streams, were rapidly restored to service. Five sprinklers on the opposite side of the pressroom operated. Heat from the fire in the duct opened sprinklers on the fourth, fifth, sixth and ninth floors. At these floors, the duct was near toilet vents served by a metal duct adjoining the pressroom duct.

The carbon dioxide system, that ordinarily could have been manually operated to flood the fan room and duct, stop the fans, close fire doors and dampers at intakes in the pressroom, had undergone its semi-annual test on the day of the fire and had not been completely returned to service when the fire occurred. After some delay some of the cylinders were discharged.

Refineries — Vegetable Oils

***May 5, Brooker, Fla. Southern Oil and Chemical Co., Inc. $250,000**

Tung nut oil extraction. Except for oil storage tanks which were detached from the unsprinklered and combustible buildings, this plant was destroyed by a fire that apparently originated in a condenser on the meal cyclone system that carried meal from the extraction building to the meal warehouse. Spontaneous heating of moist nut meal that adhered to the wall of the condenser, or ignition of meal by sparks when foreign material passed through the cyclone fan were possible causes. In the past, several fires in the cyclone condensers had been discovered promptly and extinguished with a fire extinguisher or pails of water. In this instance, however, an employee did not notice the fire until the entire under surface of the wood roof deck of the meal warehouse was in flames. The fire was so intense that the meal warehouse could not be entered by the three employees present. When volunteer firemen from towns 12 to 18 miles away arrived 20 minutes later, flames, driven by a moderate wind, had involved the dusty interiors of all buildings, including the meal warehouse, tung nut warehouse, extraction plant and several sheds. The only water available for fire fighting was carried on fire apparatus. Firemen wisely decided to use this limited supply to protect the detached tung oil storage tanks.

Rubber Working

***April 9, York Twp., Ont. Rempel Mfg. Co. of Canada, Ltd. $307,500**

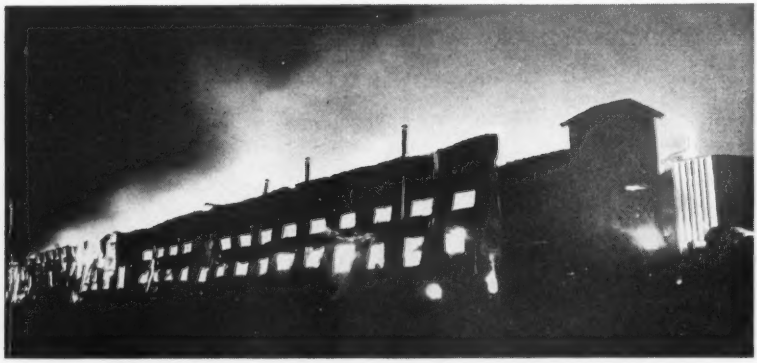
Rubber toys. Sparks from a railroad locomotive were the reported cause of a grass fire that spread into a wooden shed on a building wrecker's premises that abutted the railroad right-of-way. Adjoining the shed was a 12,750 sq. ft. unsprinklered 1-story building occupied by the rubber toy manufacturer. The lower 14 feet of the wall of this building were concrete block, the upper five feet were wood. With no watchman or automatic protection provided at either of the properties, the fire spread from the shed to the toy factory via the wooden upper part of the exposed wall before the fire was noticed by police at 2:05 A.M. When fire reached large quantities of improperly stored flammable liquids in the factory, the containers exploded throwing flaming liquid about and blowing out one wall. Two fire fighters trapped by an explosion were injured. Windows in adjacent factories were broken.

July 23, Logansport, Ind. Colonial Rubber Co., Inc. $569,500

Sponge rubber automotive weather stripping, industrial rubber goods. At 3:00 P.M. the rubber sheeting department, on the second floor of the unsprinklered 4-story brick,

Des Moines Register & Tribune

Horse blankets and aviation safety belts were among the products destroyed at this Des Moines, Iowa textile plant fire. Fire walls were not provided to subdivide the heavy concentration of high-valued stock; sprinklers were not installed to extinguish promptly any fire that might break out.



Finished and crated monuments were badly damaged when fire swept through this undivided and unsprinklered 30,000 sq. ft. stone cutting plant at Elberton, Georgia, on January 9. Highly valued tools and machinery were badly damaged if not totally destroyed by the fire, first detected by a passerby at 10:00 P.M.

B. D. Bogard

Delayed discovery, lack of sprinklers, poor water supplies and unprotected vertical openings were responsible for the $569,500 loss at this Logansport, Indiana rubber plant.

wood-joisted section of the plant, closed for the day and employees in that department went home. At 5:25 P.M. an outsider three-fourths of a mile away saw smoke coming from several places in the upper part of the building. Within seconds the roof was enveloped in flames. The fire was discovered by an employee in another section of the plant at 5:30 P.M. Several employees tried to get at the fire with extinguishers but were driven back by dense smoke from burning rubber (67,000 lbs. of sheeting were in the second story room where the fire started). With a cistern capable of supplying 250 gpm the only water supply at the site, firemen were hard pressed to save any part of the plant. Flames spread through unprotected openings to adjoining 1- and 2-story sections of combustible construction but involved only a small part of an adjoining 2-story fire-resistive section.

Aug. 7, Houston, Texas Perlman Mfg. Co. $285,500†

Foam rubber mattresses and pillows. Minutes after the last of a maintenance crew left the plant, one of them looked back and saw smoke coming from the 16,800 sq. ft. 1-story building. Firemen found an intensely hot, smoky fire involving an open top metal drum of scrap foam rubber and several portable all-metal racks containing rejected foam rubber pillows and mattresses. Using six 2½-inch hose streams, firemen confined the fire to the drum and racks and had it out in 30 minutes but during that time the intense heat had caused several unprotected steel roof trusses to buckle which allowed part of the gypsum slab roof to collapse. The building was not sprinklered. The owner has now rebuilt the plant and is "in the process of obtaining bids from the various sprinkler companies" and he has stated that "if he can get any kind of reasonable bid, a sprinkler system will be installed." Production was to have been resumed in January 1955.

Stone Cutting

Jan. 9, Elberton, Ga. Harmony Blue Granite Co. $450,000

Granite monuments. This U-shaped wood-frame, metalclad building with an area of approximately 30,000 sq. ft. was destroyed by fire discovered by a passerby at 10:00 P.M. Flames spread with great rapidity through the undivided and unsprinklered building, destroyed high-valued tools and machinery and badly damaged a large quantity of crated monuments awaiting shipment. Watchman service was not provided.

April 30, Montreal, Que. Martineau Cut Stone Co. $275,000

Stone cutting. Valuable machinery, including seven stone cutting saws, was lost when fire that broke out during the night destroyed the large 1-story wood-framed metalclad building. No automatic protection or watchman service was provided. Consequently, when the fire was discovered by a chance passerby at 10:15 P.M., it was beyond control.

Textile Working

Feb. 5, Des Moines, Iowa Boyt Harness Co. $455,000

Aviation safety belts, gun cases, horse blankets; storage of household appliances. Total destruction of this 30,590 sq. ft. 1-story masonry, steel-joisted plant can be traced to three well known fire protection weaknesses: no automatic protection or watchman service, no division walls to limit the area of the building subject to a single fire, and heavy concentration of high-valued stock in an area all subject to destruction by the same fire. The fire was beyond control when first discovered during the night.

April 3, Portage La Prairie, Manit. Delta Apparel Industries, Ltd. $306,500

Clothing. A weak water supply for sprinklers and lack of subdivisions combined to cause destruction of this 40,000 sq. ft. 1-story brick, wood-joisted building. While working alone in the building, (Saturday afternoon) the owner heard a peculiar noise and traced it to a small fire in a corner of the designing room 150 ft. away. A vain attempt was made to extinguish the blaze with an extinguisher but the fire gained rapid headway and while the owner was telephoning the alarm, flashed through much of the lint-covered interior. As fire apparatus was leaving the station, an alarm was being received from the central station which supervised the protection provided through a connection to the waterflow alarm. The large number of sprinklers that opened almost simultaneously, quickly overtaxed the single source water supply (street mains) and reduced sprinkler effectiveness to zero. Inadequate water supplies also severely handicapped firemen in their efforts to get water to protect exposures.

June 2, Kansas City, Mo. Alex Catalano, et al. $487,000

Ladies' dresses, printing. Fire of undetermined cause spread throughout a sprinklered dress cutting room on the third floor of the 3-story building and into the finishing room through a fire wall opening. The fire door at the opening was blocked open by a ramp. All 176 sprinklers on the dry pipe systems in both rooms (12,314 sq. ft.) operated and held the fire in check until extinguished by firemen. Water damage to printing presses, paper and textiles on lower floors was heavy. Reports state that the sprinkler systems were not equipped with quick opening devices, a fact that might explain inability of the sprinklers to confine the fire to the area of origin.

***July 20, Winston-Salem, N. C. Dize Awning and Tent Co. $280,000**

Canvas awning and tents; venetian blinds. A 1-story masonry, wood-joisted building and a large metalclad addition, which because of unsprinklered communicating passageways and connecting awnings comprised a single fire area of 18,800 sq. ft., were destroyed by fire that broke out while the plant was in operation. Origin was in the basement where tent cloth was being passed through an open dip tank of waterproofing material mixed with a solvent having fire hazard properties similar to kerosene. The tank was heated by steam supplied by a boiler 12 feet away. When vapors from the tank of heated liquid spread along the floor to the fire box of the boiler, flames flashed back through the vapors to the unprotected dip tanks. The ensuing hot fire spread to canvas and drums of flammable liquids and was shortly beyond control in the undivided and unsprinklered building.

Aug. 3, Louisville, Ga., General Shirt Corp. $325,000

Men's cotton shirts. Neighbors are not adequate substitutes for automatic fire protection equipment or watchman service, as was evidenced by fire that destroyed this unsprinklered 31,000 sq. ft. 1-story brick, wood-joisted factory. The fire originated in the shallow inaccessible attic above the 10,500 sq. ft. "sewing room" and was noticed by neighbors (who did not realize that the unusual light in the building was a fire)

at least two hours before one of them took the initiative and called the fire department at 9:00 P.M. On arrival firemen found the shallow attic between the metal roof and combustible fibreboard ceiling in flames, and because of the intense heat they were unable to attack the fire from the cutting room. Positions were taken up at unprotected doorways in a brick wall that separated the sewing room from the cutting room but a short time later a fire gas explosion spread fire with great rapidity throughout the linty interiors of the sewing and cutting rooms. The fire demonstrated again the importance of sprinkler protection and fire doors in fire wall openings if fires are to be controlled with a minimum of damage. The fire also showed the fallacy of providing watchman protection for only part of the night. This plant closed at 5:00 P.M. but the watchman was not required to come on duty until 10:00 P.M., one hour after the fire was discovered.

Dec. 6, Rock Hill, S. C., M. Lowenstein & Sons, Inc. $2,500,000†

Cloth aging, printing, soaping and dyeing. Errors on the part of employees, apparently due to lack of adequate training in fire emergency procedure, allowed fire that should have been confined to a small area of the roof to damage severely 26,000 sq. ft. of roof and the contents below. Were it not for strong water supplies, it is possible that the entire undivided 400,000 sq. ft. 1-story masonry, steel-joisted sprinklered building would have been destroyed.

The fire originated about 11:15 P.M. in a metal ventilating duct where the duct passed through the vertical wall of a roof monitor. Ignition of lint in the duct by friction at the blower was a likely cause.

On noticing smoke in the monitor employees of the small night shift operated a private fire alarm system that summoned other employees with extinguishers. When some of the men went to the roof and opened up a hot spot in the monitor end wall, a 1-inch-thick corkboard insulation between the metal covering and plank interior finish blazed up. (The roof had sawtooth monitors with many windows and window fans. The monitor end walls were constructed of weather-tight, lock-jointed galvanized sheet metal, on heavy asphalt saturated roofing felt, on 1-inch-thick corkboard, on similar felt, on 3-inch splined wood plank with vertical joints. The extensive insulation was designed to prevent condensation spotting of cloth in process.) Extinguishers directed at the fire from the roof appeared to be effective but subsequent events indicated that fire was spreading through the corkboard insulation.

In the meantime men inside the plant used a standpipe hose on the monitor planking and at 11:21 P.M. the first of three sprinklers in the monitor opened. At 11:25 P.M. the fire appeared to be out to men inside the building and an employee in another section of the plant was advised by telephone to close sprinklers. At 11:30 P.M. the valve was closed and a drain valve opened. No one was stationed at the valve to reopen it promptly in case this should be necessary. Events proved this to be a serious oversight

Bishoff's Studio

An undivided and unsprinklered 300-ft.-long group of communicating wooden buildings was destroyed at the woodworking plant at Moorefield, W. Va. April 12.

since shortly after the valve was closed, flames came through roof and monitor planking. Sprinklers were ordered put back in service but during the ten minutes required to do this, flames spread rapidly along the under surface of the roof and by the time the water was turned on so many sprinklers had opened that the system in the area of origin could not control the fire in the roof and combustible contents at floor level. Sprinklers in adjoining areas also began opening and, in all, 780 sprinklers fused.

The fire department was not called until 11:43 P.M. and plant fire pumps were not started until 12:05 A.M. Fortunately, the two-source water supply for sprinklers (75,000-gallon elevated tank and two 8-inch connections to city mains) was sufficiently strong to restrict the spread of fire prior to operation of fire pumps. Had operation of pumps been delayed much longer, it is conceivable that the fire would have spread throughout the rest of the plant since the gravity tank was almost empty when the pumps were started and there were no fire walls. Sprinklers and hose streams controlled the fire by 4:00 A.M.

Woodworking

Building Supplies

***April 12, Moorefield, W. Va., F. C. Cook & Co. $320,000**

Wood flooring. A 300-ft.-long group of adjoining and communicating wooden buildings, 1, 2 and 3 stories high, was destroyed by fire that originated at a mobile-type Diesel engine being used to drive a planer. Although the employee who discovered the fire did not see it start, it has been theorized that an electrical fault may have ignited oil on the engine block and that fire spread from the block to shavings on the floor.

The fire department was called at once but before its arrival heat caused the 65-gallon fuel tank mounted in front of the engine to explode and spread flames over a wider area. The fire originated in the extreme south end of the group of buildings and winds at the time were from the north. With such favorable circumstances one might ask why part of the group of buildings was not saved. The following conditions give the answer: 1, the buildings were not sprinklered; 2, they were not separated by fire walls; 3, they were dusty; 4, the fire pump that supplied yard mains was put out of service early in the fire when flames enveloped the combustible pump house.

***Nov. 13, Wadsworth, Ohio Eejay Co. et al., $465,500**

Wooden storm windows, lumber storage, corn cob grinding, radiators. Four buildings were destroyed by fire that was beyond control in the 125 ft. by 100 ft. 3-story wooden building housing the storm window plant when discovered by an outsider at 8:30 P.M. Absence of sprinkler protection was the most flagrant fire protection weakness in the building of origin. Despite a favorable wind that was blowing away from three buildings separated from the building of origin by a driveway, the other buildings in the exposed properties were destroyed.

Furniture Factories

March 23, near Canton, Miss. King Lumber Industries $750,000

Dimension mill and cooling shed at wood furniture factory. The sprinklered 105,000 sq. ft. 1-story wood-frame, metalclad dimension mill and cooling shed was practically destroyed by fire that originated in the unsprinklered space between the ground and floor (from 6 inches to 4 ft. in height). Although confined to a relatively small area when discovered by the watchman at 2:15 A.M., the fire spread rapidly through the undivided subfloor space before the private fire brigade and public fire department could get hose streams in operation. When the more than 2,000 sprinklers in the buildings were fused by the heat from the subfloor fire, the water supply from a 100,000 gal. elevated tank and two 1,500 gpm fire pumps was overtaxed. Fires burned up through the floors and spread rapidly through combustible contents to all parts of the undivided building.

July 13, High Point, N. C. B. & W. Upholstering, Inc., et al. $335,000

Upholstered furniture, wood panelling, furniture hardware. The second of three serious fires that occurred within a 5-hour period in High Point destroyed this sprinklered 37,870 sq. ft. 2-story building of

mixed construction. (See also page 229 of this QUARTERLY.) The fire occurred while most of the fire apparatus and manpower were busy at the first fire and consequently there was some delay before a full complement of apparatus and manpower were at the scene. However, this delay is not considered serious since the two engine companies that did respond immediately found fire coming through the roof in one section of the building and flames spreading into the communicating section.

Failure of the building operators to instruct the boiler tender, the only person in the building during the night, in proper procedure if the sprinkler bell rang was responsible for the fact that the fire was beyond control when firemen arrived. The tender, on hearing a sprinkler alarm ringing, shut off the valve controlling the operating system. He did not investigate the cause (he was not permitted to enter certain sections of the building) nor did he call the fire department.

The fire was discovered by a passerby at 12:40 A.M., but by then, the fire was beyond control in the section of origin (sprinkler protection for the section having been shut off by the tender). Fire and heat had also swept into the communicating sections where sprinklers were still in service. The large number of sprinklers that opened almost simultaneously in the exposed sections overtaxed the water supply.

Aug. 11, North Wilkesboro, N. C. Oak Furniture Co., Inc. $300,000

Bedroom furniture. During alterations to part of the 31,772 sq. ft. 2-story building of mixed construction, it had been necessary to shut off sprinklers protecting a dry kiln on the first floor. Fire discovered in the unprotected kiln at 1:30 A.M. by the plant firemen burst out of the kiln (in which 45,000 board feet of lumber were being dried) before volunteer firemen reached the scene and had overpowered sprinklers in the adjoining cooling room. Fire spread beyond control in the cooling room and entered adjoining sections through unprotected doorways and conveyor openings in fire walls that formerly subdivided the long building into fire areas. Fire also spread to adjoining sections by way of a combustible addition that extended around the ends of fire walls. No attempt was made to pump into the sprinkler system, and water was not conserved for sprinklers in uninvolved sections by closing control valves in sections

Mason Studio

Sprinkler protection for the dry kiln where this fire originated had been shut off because of building alterations. The masonry walls shown in the photo were of no value as fire barriers because of unprotected doorways and conveyor openings. A furniture factory occupied the building at North Wilkesboro, N. C.

This fire in a Brocton, N. Y. furniture factory originated because of careless use of a welding torch near a spray booth. It spread beyond control because of a weak single source water supply for sprinklers.

that were beyond saving. Overheating of a bearing on a fan operating in the kiln was a probable cause.

***Sept. 19, Whitefield, N. H. Mellin Quincy Mfg. Co., Inc. $450,000†**

Wooden furniture. Two sprinklered 3-story wooden buildings were destroyed and the roof of the 1-story boiler house was burned off by fire that broke out after lightning struck the elevator penthouse on the roof of one of the 3-story buildings. Neither of the buildings was equipped with lightning protection.

Fortunately the fire occurred on Sunday afternoon when employees were not in the building since neighbors stated that the lightning appeared to travel through the 12,600 sq. ft. third story, used for spraying and dipping furniture, and that it was very quickly enveloped in fire. No special protection was provided for dip tanks. With the almost simultaneous operation of all sprinklers on the dry pipe system, the single source water supply was overtaxed (estimated 660 gpm available at 20 psi). Firemen, using water drafted from a near-by river, were unable to prevent wind-driven flames from spreading through the passageway to the adjacent 3-story building. They were unable to pump into the sprinkler system, a procedure that would have offered the most efficient means of getting water on the fire, since the sprinkler systems were not provided with fire department pumper connections. It is thought that the essential equipment was omitted from the systems since the town had no pumper in 1911 when the sprinkler systems were installed.

Oct. 4, Brocton, N. Y. Brocton Furniture Co. $612,000

Furniture. The 3-story brick, wood-joisted and brick, plank and timber building was destroyed by fire that originated because of careless use of a welding torch. It spread beyond control because of a weak single source water supply for sprinklers. Fire broke out in the finishing department on the third floor while a maintenance man was using a welding torch near a spray booth. The spray booth

and surrounding area had not been thoroughly cleaned before welding was commenced. The fire spread rapidly through the undivided top story and was almost immediately beyond control of the sprinklers on the dry pipe system because of weak water supplies from a long 6-inch dead end main that was able to supply only about 500 gpm. Firemen were on the scene in five minutes and the first engine company pumped into the sprinkler system. No additional water could be obtained from other hydrants until plants in the town complied with orders to stop use of water. Thereafter, firemen were able to supply two 2½-inch and four 1½-inch hoses but by then the 3-story building was beyond saving. A fire wall with double fire doors at all openings prevented spread to an adjoining 2-story warehouse. Early in the fire employees closed all fire doors. Insurance claims returned only $381,009.30 of the actual loss.

Plywood

Aug. 12, near Allendale, S. C. Allendale Door and Plywood Mfg. Co. $250,000; 1 killed

Plywood. The employee who was accustomed to arrive at the mill an hour early and sleep until the mill opened lost his life when fire destroyed the large wooden building. The fire had made considerable headway before discovery and continued to burn unchecked as fire fighters from Allendale had to stand by helplessly with no water supply available.

Nov. 16, near Tarboro, N. C. General Plywood Corp. $575,000

Plywood. This 1-story wooden building comprising an unsprinklered fire area of 65,000 sq. ft. was destroyed by fire that originated at a dryer. The fire was discovered without much delay by employees and attacked with two 1½-inch standpipe hose streams. However, flames spread so rapidly through the wooden building and to stacks of plywood occupying about every bit of floor space not required by kilns, dryers and machinery that employees had to drop the standpipe hoses and flee. Because the standpipe hoses were left running and because the water supplies from a long dead end 6-inch main that supplied standpipe hoses and yard hydrants were weak, employees were unable to get effective hose streams for yard hydrants. The firemen from Tarboro, ½ mile away, were called and responded at once but the entire plant was in flames when the first engine company arrived.

Saw and Planing Mills

***July 9, Rapid City, S. D. Warren-Lamb Lumber Co. $250,000**

Sawmill, power house. During a severe electrical storm, the 11,000 sq. ft. 2-story wooden sawmill burst into flames. It is presumed that lightning struck the unoccupied building, setting a fire that spread rapidly through the dusty interior. A large number of sprinklers on the dry pipe system opened. Because of the relatively weak single source water supply which was not capable of supplying so many heads simultaneously, the sprinkler protection was quickly nullified.

The mill was completely involved when firemen, summoned by plant personnel in other buildings, arrived. Winds also carried the fire to the plant's combustible power house about 20 ft. from the sawmill. These buildings were lost but local firemen, using water from a millpond and assisted by firemen responding on a mutual aid call, were able to save a large sprinklered box factory seriously exposed.

***July 13, Keltys, Tex. Angelina County Lumber Co. $641,500**

Dry kiln and several sorting and storage sheds at sawmill. Shortly after the night watchman reported for duty at midnight he discovered fire in the dry kiln building. A wiring fault at a water cooler on a platform near the kiln was the probable cause. The fire spread through congested sorting and drying sheds destroying an estimated 4,000,000 ft. of lumber. Using water from a mill pond, firemen from Lufkin, three miles away, saved the planing mill, sawmill, and power houses.

Sept. 23, Longlac, Ont. Longlac Pulp and Paper Co. $350,000

Sawmill. When two jobs require one man's attention, one or both of them is apt to suffer. This was the case at this sawmill where the night watchman was also the boiler fireman.

At the time fire broke out in this 2-story wooden building, the night watchman was busily engaged in cleaning the boiler grates and consequently did not discover the blaze until it was beyond control. Fire swept through the undivided and unsprinklered building feeding on a four-month accumulation of sawdust.

The 54 Largest Warehouse Fires of 1954

The 54 "large loss" warehouse fires in 1954 were six more than in 1953, and the largest number ever reported in one year. Losses totaled $36,504,500. There were 8 deaths and 102 injuries.

The high concentration of valuable contents, which is a large loss fire potential inherent in most warehouses, was complicated by the fact that in 70 per cent of the fires excessive areas further increased the amount of contents subject to destruction in a single fire. Seven out of ten of the warehouses involved were 1-story structures in which subdivision of large areas by erection of fire walls would have been relatively inexpensive. Since 88 per cent of the buildings were essentially of combustible construction and a like per cent had no automatic protection, the absence of fire division walls was a vital fire protection weakness.

As is usually the case, a majority of the warehouses involved in "large loss" fires were not operating or were only in partial operation when the fires occurred. Half of the fires were first detected by outsiders; only four were discovered by a watchman. In the one warehouse equipped with an automatic fire detection system (food warehouse, West Sacramento, Calif., Jan. 5), the fire was detected and the alarm transmitted by the rate-of-rise type, fire-department-connected system. However, the fire was beyond ready control when the first fire company arrived.

Three of the warehouses were equipped with complete automatic sprinkler protection. In the case of the rubber warehouse fire in Buffalo, March 8, the sprinklers had been shut off on the floor of fire origin because of building alterations. In the Dewitt Twp., N. Y. hardware warehouse fire of August 13 the spray sprinkler system confined the flammable liquid fire to a relatively small area of the undivided building. Lack of supervision of the system resulted in delayed discovery of the fire and consequent heavy water damage. A damaged water main necessitated shut-off of the sprinklers in the military warehouse near Edmonton, Alberta, Nov. 11. The fire occurred an hour before service was to have been restored.

In addition to the three large loss warehouse fires in completely sprinklered buildings, there were three others where partial sprinkler protection was provided. Fire entered a sprinklered glass warehouse in Somerville, Mass., March 18 from a communicating unsprinklered warehouse. The sprinklered building was destroyed. Partial sprinkler protection was of no value in the fertilizer warehouses at Chicago, June 18, for two reasons: 1) the fire originated in an unsprinklered area, 2) the system was shut off while the dry pipe valve was being repaired. Partial sprinkler protection with the help of a fire wall performed satisfactorily at High Point, N. C., July 13.

In 29, or more than half, of the "large loss" warehouse fires, the probable causes were determined. Six of the fires were incendiary or suspicious and five were due to mishandling or improper storage of flammable liquids.

Automobiles in Storage

Feb. 12, Paducah, Ky. Woodall Motor Co., et al. $400,000

New car storage garage, tire shop, bar, shoe repair shop. When buildings are left during the night without automatic protection or watchman service, chances are that any fire that may break out will spread beyond control before discovery. Fire was burning in the two upper stories of the section of the unsprinklered 3-story building occupied for new car sales and storage when firemen answered a passerby's alarm at 11:05 P.M. Hoses were taken in the front entrance but heat was so intense that firemen were forced back outside. Thereafter hose streams were used to prevent spread to adjoining buildings. Although fire damage was confined for the most part to the building of origin, the adjoining 1-story buildings were badly damaged when a brick wall of the building of origin fell out. The insured loss is estimated at $109,070.

***June 1, Edgewater, N. J. Hudson River Properties, Inc. $1,200,000**

Two pier warehouses, vacant industrial building. Two communicating 1-story wood-framed metalclad pier sheds with a total area of 103,000 sq. ft. were destroyed along with an adjacent 30,000 sq. ft. 2-story industrial building. Children swimming and smoking at the end of the pier probably started the fire which had entered the undivided pier shed, in which 100 new cars and six used trucks were stored, before discovery. Strong winds helped spread the fire through the 930-ft.-long shed and to the adjacent exposure. The building had formerly been protected by sprinkler systems and the equipment was still intact, except that the water supply had been disconnected.

Building Materials

***July 13, High Point, N. C. Snow Lumber Co. $300,000**

Two builders' materials warehouses, two lumber storage sheds, storage and glazing building, roofing warehouse, 253,000 board feet of yard-stored pine lumber. Poor as well as good fire protection features were in evidence at this fire that broke out while firemen were gaining control of the second of two previous serious fires that had occurred that night in High Point. Failure of the plant watchman to discover the fire on one of his hourly tours of the buildings indicated a serious weakness in watchman

W. Manchester Fire Department

This W. Manchester, Pa. building materials warehouse comprised a single fire area of 40,000 sq. ft. The fire was beyond control when discovered by an outsider.

protection. The fire was first discovered by firemen working at an industrial plant fire 300 ft. away (see fire, July 13, p. 224). At that time the 5,400 sq. ft. unsprinklered half of a 1-story metalclad builders' materials warehouse, and the 10,651 sq. ft. unsprinklered 1-story wood-framed metalclad storage and glazing building, as well as a freight car on a siding between the two buildings, were involved.

Because all except one engine company were working at the industrial plant fire, there was a delay before many streams could be placed in operation. The fire, therefore, had further time to spread unchecked. Yard-stored lumber and four unsprinklered storage buildings were destroyed before it was finally brought under control.

Absence of sprinklers in half of one building and all of five buildings was a serious fire protection weakness that became evident as the fire progressed. Sprinklers operating in the sprinklered half of the builders' supplies warehouses and eave sprinklers operating along the side exposed by the storage and glazing building were a major factor in saving the sprinklered half of the building. Another good fire protection factor was a parapeted fire wall between the unsprinklered and sprinklered sections. The doorway between the two sections was protected by double fire doors. Sprinklers on the exposed side of the main mill were given a large share of credit for saving the mill, and a 10- to 20-ft.-high brick wall that separated the lumber yard from adjoining industrial property was an important aid to firemen in their successful effort to prevent a conflagration. Arson is suspected since three separate serious fires occurred during the same night.

Hawaii Fire Marshal

Typical storage conditions in the surplus property warehouse in Honolulu prior to the fire of November 14.

Sept. 25, West Manchester Twp., Pa. Union Roofing and Paper Co. $500,000

Roofing material. Fire of unknown cause destroyed the undivided and unsprinklered 1,000-ft.-long brick, steel-framed warehouse loaded with tar and other combustible roofing materials. The fire was beyond control when discovered by an employee in a near-by garage at 4:25 P.M. (Saturday). Long hose lays were required to get water for protection of exposures.

Hawaii Fire Marshal

Pre-fire photo of the interior of the Honolulu warehouse.

Hawaii Fire Marshal

Another pre-fire photo of the Honolulu surplus property warehouse.

Hawaiian Pineapple Co.

As repeated explosions occurred in the warehouses at Honolulu, burning embers were blown into the air, some traveling a quarter of a mile.

***Nov. 14, Honolulu, Hawaii Territory of Hawaii, et al. $900,000**

Surplus property warehouse, building materials warehouse, five carpenter shops, printer. Excessive unbroken areas, wooden construction and lack of private fire protection caused the destruction of four buildings that had been built during World War II to provide critical warehousing space. The undivided areas of the buildings ranged from 19,200 sq. ft. to 35,200 sq. ft.

At 8:06 P.M. a neighbor noticed a glow in the warehouse area and gave the alarm. Firemen found the 35,200 sq. ft. building (loaded with all kinds of materials ranging from mattresses to drums of gasoline) fully involved. Heat from the fire ignited two wooden buildings within 20 ft. of the building of origin and they in turn ignited a fourth.

Three boys, aged 7, 8 and 10, have admitted setting the fire. The three boys had prior police records.

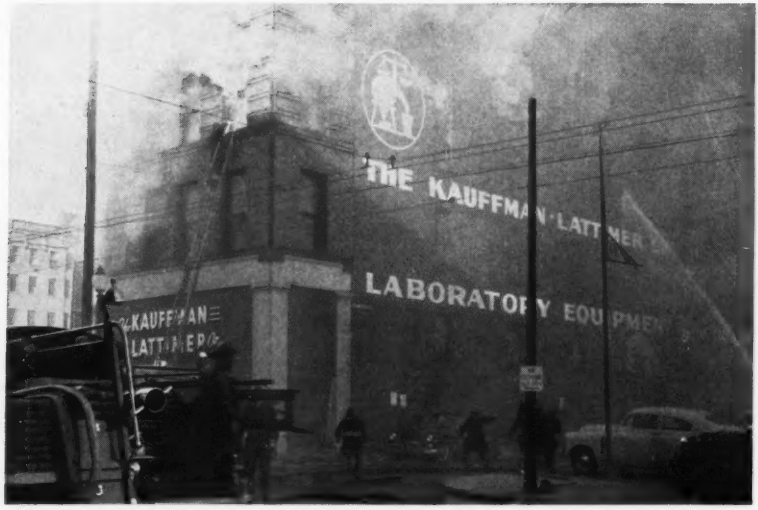
Chemicals

Feb. 17, Columbus, Ohio Kauffman-Lattimer Co. $355,000

Wholesale drugs, chemicals, laboratory equipment. While filling an order, an employee dropped a 5-pound bottle of petroleum ether on the concrete basement floor adjacent to an open dumb-waiter shaft.

While he was gathering the broken glass, the vapors ignited at a gas-fired hot water heater five feet away. Flames spread rapidly and by the time employees in the five-floor office building had been advised of the fire, telephone wires had burned.

Flames spread through the open dumbwaiter shaft to all floors of the 3,750 sq. ft. unsprinklered 5-story brick, plank and timber building. Combustible chemicals and flammable liquids which were present in large quantities contributed to intensity of the fire.



Columbus Dispatch

A dropped bottle of petroleum ether, a gas-fired hot water heater and an open elevator shaft spelled "large loss fire" in this Columbus, Ohio chemical warehouse.

June 17, Pomona, Calif. Charles E. Duggan Co. $250,000

Parathion and other insecticides. Lack of watchman service or automatic fire protection equipment allowed fire to make great headway in this 9,600 sq. ft. 1-story wood-framed, metalclad warehouse before discovery by a passerby at 11:15 P.M. When firemen arrived, drums of chemicals were exploding and it was evident that exposure protection was of utmost importance. Despite the toxicity of the fumes evolved from the fire, no firemen were seriously affected.

Clothing Warehouse

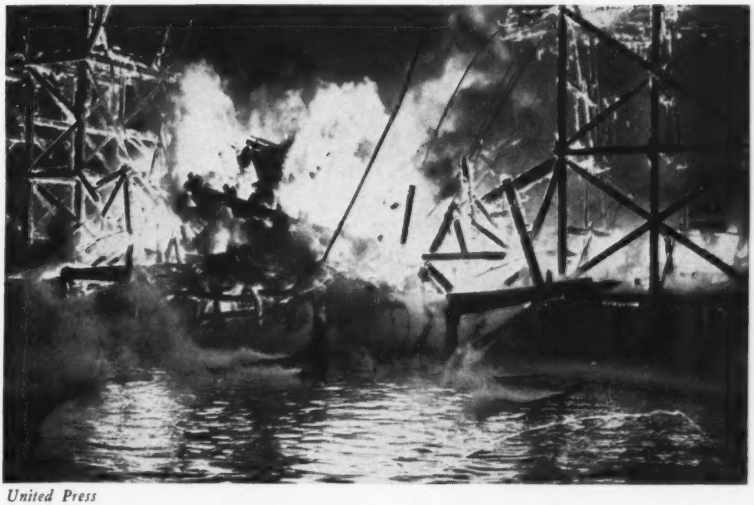
Jan. 1, Columbus, Ohio McClure-Tritschler-Parrish $447,500

Wholesale dry goods (ready-to-wear clothing); some retail sales. At 5:30 P.M. December 31, 1953 this unsprinklered 9,500 sq. ft. 6-story brick, wood-joisted building was locked up for the holiday weekend. At 7:57 P.M. January 1, 1954, the fire department received simultaneous alarms from the central station that supervised the burglar alarm system and from an occupant of a nearby building. Flames were coming from windows on all floors and were coming through the roof when the first engine company arrived. During demolition of the building, a wall fell on and heavily damaged an adjoining 3-story building. The $447,500 loss does not include this damage.

Coal

Jan. 25, Portland, Me. Pocahontas Fuel Co. $1,000,000

Coal wharf with coal pocket. A 500 ft. by 118 ft. wooden wharf on wood piles, a crane trestle and cranes were destroyed by fire believed caused by spontaneous heating of soft coal piled on the wharf. The pile was 400 ft. long, 60 ft. wide and 40 ft. high. Smoke from the fire in the pile was noted by the watchman at 11:56 P.M., January 24, but he did not investigate until about 30 minutes later, by which time firemen were responding to an alarm transmitted by a ferry boat crew who saw the fire beneath the wharf when passing. By then fire in the pile had burned through the 3-inch plank wharf deck and was spreading through the undivided substructure. On breaking through



United Press

Spontaneous heating was the probable cause of three "large loss" warehouse fires in 1954. This one at Portland, Me. originated on a coal wharf in a pile of soft coal 400 ft. long, 60 ft. wide and 40 ft. high.

T & D Studio

A 14-year-old boy set this Dillon, S. C. cotton warehouse fire "to see if a bale of cotton would burn."

to the top of the pile fire extended rapidly along the surface. Eight pumpers, one fire boat and four Coast Guard boats used 46,000,000 gals. of water to extinguish the fire.

Although pipes and thermometers were provided to check for spontaneous heating, no periodic readings were taken.

Cotton

Jan. 28, Dillon, S. C. South Carolina State Whse., No. 3791 $400,000

A 14-year-old boy admitted entering the 56,000 sq. ft. 1-story brick, steel-framed warehouse with three companions and setting a fire "to see if a bale of cotton would burn." Since no sprinkler protection was provided the fire spread rapidly over the 1,500 bales in the undivided building and caused the steel roof framing to collapse. Despite several recent suspicious fires in this and other warehouses, no watchman protection had been provided.

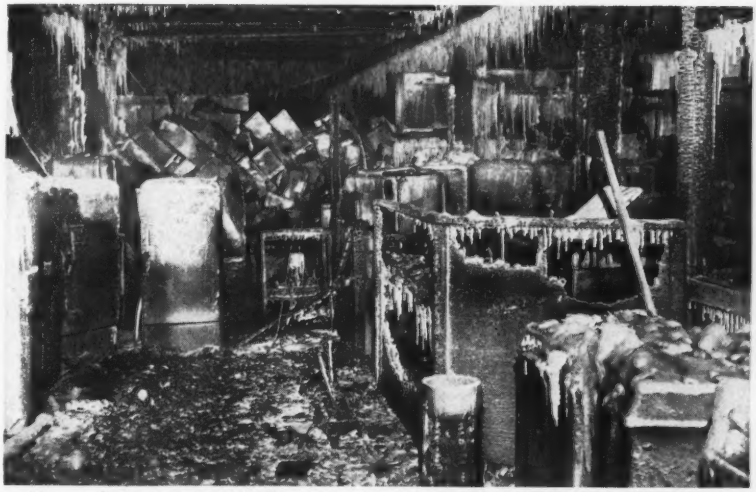
March 21, Dallas, Tex. Farmers & Merchants Compress & Whse. Co. $259,000

1,347 bales of cotton. Failure to protect the warehouse against easy access by trespassers (one side open, no fences around premises) and failure to provide sprinkler protection were the two principal factors responsible for the destruction of 1,347 bales of cotton stored in one of four compartments of the 1-story, wood-framed, metalclad building. Starting out on his 4 P.M. tour, the plant watchman found three boys in a compartment of the warehouse and fire burning on bales on both sides of a 9-ft.-wide aisle. The boys informed the watchman that they had already pulled the private fire alarm box in the compartment, which was confirmed by the fact that apparatus was approaching as the watchman ran to telephone the alarm. Fire had spread to all parts of the compartment when firemen arrived. Sixteen-inch-thick brick fire walls saved loaded compartments on either side. When apprehended later, the three boys, aged 9 to 11, admitted that they had been playing in the cotton warehouse for at least a half hour before setting the fire with matches.

***April 16, Dunn, N. C. Matthews Cotton Co., et al. $500,000**

Baled cotton warehouse, vacant building. After being struck by a bolt of lightning at 5:48 P.M., the 60,000 sq. ft. 1-story wood-framed, metalclad warehouse and its contents

Despite the presence of 25 sleeping people in second floor apartments, fire originating in the basement of this Council Bluffs building (electrical equipment warehouse) was first detected by a passerby.



No watchman or automatic fire protection was provided in this Fargo, N. D. electrical equipment warehouse. The fire had spread from the basement to the first story before discovery by police at 4:55 A.M.

of 2,377 bales of cotton were quickly enveloped by fire. By the time firemen answered alarms telephoned by eyewitnesses, both the cotton warehouse and a recently vacated 1-story masonry, wood-joisted garage building 15 ft. downwind, were involved. Fire had entered the latter building through plain glass windows in the exposed wall. Lightning rods and automatic sprinklers had not been installed in the building of origin nor had the excessively large area been subdivided by fire walls. Firemen were able to save some seriously exposed adjacent buildings valued at well over $2,000,000, despite high winds.

Dec. 21, near Frederick, Okla. Traders Compress $800,000

4,521 bales of cotton. On one of his supervised 15 minute rounds of the buildings at this compress, the watchman discovered fire in an undivided and unsprinklered 81,000 sq. ft. 1-story wood-framed, metalclad storage section. The watchman tried to control the fire with first aid equipment. The fire department, summoned by a passerby, was on its way to the fire when the watchman decided to give the alarm. The fire spread rapidly over the 4,521 bales of cotton in the undivided storage section. A parapeted fire wall saved an adjoining storage and compress section.

Electrical Equipment

Jan. 3, Council Bluffs, Iowa World Radio Laboratories, et al. $285,000

Wholesale radio and electronic equipment storage, apartments. On the day that the principal tenant of the unsprinklered 2-story brick, wood-joisted building was to move its large stock of radio and electronic equipment to a new location, fire destroyed the building and its valuable stock. The fire originated in the basement and was not discovered until seen by a passerby at 7:00 A.M. despite the fact that there were about 25 people asleep in second story apartments. By pounding on the doors the passerby managed to arouse all occupants in time for them to escape down stairways which by then were rapidly filling with smoke. The 6,720 sq. ft. basement was well involved by the time firemen arrived and fire soon thereafter burned through flooring and entered the first story. Concentration of stock at rear doorways hampered fire fighting.

***Jan. 15, New York (Brooklyn), N. Y. Mulckor Warehousing Co., et al. $1,750,000**

Three buildings destroyed, one damaged. 4,000 TV sets, 1,000 TV cabinets. At 10:30 A.M. an employee unloading a freight car out-

side a 4-story brick, plank-on-timber warehouse saw smoke drifting down from windows in an upper story and gave the alarm. The fire was by then so far advanced in the unsprinklered building that before it could be controlled 8½ hours later it had destroyed the building of origin, two adjoining and communicating buildings and had damaged a fourth. Cause of the fire was not determined. It may have originated at one of the 18 oil heaters being used to heat the second and third stories of the building of origin. Thirteen firemen were injured and two pieces of fire apparatus were demolished when one of several explosions during the fire blew out a section of brick wall.

Jan. 21, Fargo, North Dakota Meyers-Taube Co. $350,000

Wholesale electrical appliances. Delayed discovery permitted fire to burn out the interior of the unsprinklered 2-story brick, wood-joisted building. Originating in the basement, the fire spread through joist channels in the basement and burned through flooring to the first story before discovery by police in a cruiser at 4:55 A.M. No watchman or automatic protection was provided.

June 24, Portland, Ore. Portland Electric and Plumbing Co. $559,500

Electrical fixtures and plumbing supplies. The 10,000 sq. ft. second story and half of the roof of the unsprinklered 2-story concrete, wood-joisted building were destroyed by fire that originated in the second story. A disgruntled employee is believed to have set several fires in excelsior from packing cases. Following discovery of the fire by employees there was a delay of several minutes in fire department notification as employees tried to extinguish the fire in Class A materials with a carbon dioxide extinguisher. This delay allowed fire to spread beyond control before arrival of firemen.

Oct. 15, Dayton, Ohio Ohio Appliances, Inc. $492,500

Radar, television sets, electrical household appliances. With no automatic or watchman protection to assure prompt fire detection and control, the fire that destroyed this undivided, 16,000 sq. ft. 1-story brick, steel-framed building burned an estimated six hours before being noticed by a passer-by at 5:38 A.M. When firemen arrived, the interior with its large stock of appliances

Frank Sterrett

Six "large loss" warehouse fires were believed purposely set, including this electrical equipment warehouse at Portland, Oregon.

in combustible packing cases was in flames. Fire department investigators concluded that a fault with the building wiring caused the fire.

Dec. 22, Hamilton, Ont. The Canadian Comstock Co., et al. $250,000

Electrical equipment and appliances for conversion from 25 to 60 cycle electric service. Thirteen minutes after the watchman punched his clock outside the motor repair room (separated from the rest of the interior of the building by tarpaulins hung over screening) employees loading trucks on a loading platform at the other end of the building noticed smoke. They investigated and found fire in the vicinity of a work bench in the motor repair room. Several extinguishers were used until fire spread up the combustible fibreboard wall finish and to the corrugated cardboard ceiling finish. Flames then spread so rapidly through the undivided and unsprinklered 12,000 sq. ft. 1-story wood-frame, metalclad building that the employees had difficulty escaping. The entire interior was in flames when the first fire engine arrived.

Because of the rapid turnover of stock and destruction of inventory records considerable difficulty is being experienced in arriving at the value of destroyed contents.

United Press

This fertilizer warehouse in Chicago was equipped with a partial sprinkler system. The fire originated in an unsprinklered area. The system was shut off for repairs.

Fertilizer

June 11, New Bern, N. C. Baugh and Sons, et al. $250,000

Fertilizer and department store storage. The large area U-shaped 1-story wood-framed, metalclad warehouse was destroyed by fire that originated in the fertilizer storage section (bagged blended fertilizer; sodium nitrate). Firemen answering an outsider's alarm at 6:00 P.M. found the building heavily charged with smoke and were forced to attack from outside, a particularly serious handicap in this instance since the area where the fire was centered was over water, and therefore inaccessible. Flames spread through the 350 ft. length of the section of the building occupied for fertilizer storage and broke through a flimsy partition to envelop the department store warehouse section. No watchman or automatic protection was provided.

June 18, Chicago, Ill. Armour & Co. $250,000

Tankage, bone meal fertilizer, grinding, baggage. The 14,300 sq. ft. 5-story brick, wood-joisted building, small areas on each floor of which were sprinklered, was destroyed by fire that originated on the second floor in an unsprinklered area. The fire was discovered by the watchman at 6:16 A.M. and was then so far advanced that it could not be checked before spreading through numerous chute and conveyor openings to all stories of the dried out and dusty building. Because of repairs to the dry valve, the sprinkler system was out of service at the time of the fire. However, it is doubtful if sprinklers would have offered much protection had they been in service since the fire originated in an unsprinklered area and only part of each story was sprinklered.

Food and Groceries

Jan. 5, West Sacramento, Calif. Haslett Warehouse Co., et al. $944,000

Sugar, beans, canned goods. Storage of merchandise too close to a gas-fueled space

heater suspended from the ceiling was the reported cause of fire that destroyed the undivided and unsprinklered 100 ft. by 200 ft., 1-story metalclad warehouse. The fire was detected by the rate-of-rise type automatic fire detection system. Employees working in a building 50 ft. away heard the alarm bell and the fire department received the alarm automatically.

However, the fire spread so rapidly over the merchandise and fibreboard which lined the walls and roof louvers that fire fighting had to be conducted from the street. Water from mains was so limited that some of the engine companies responding to multiple alarms could not be supplied and since there were no pumper approaches to a river that flowed by the building, these companies returned to quarters. What water was available protected exposures.

April 21, Cleveland, Ohio Eagle Wholesale Grocery Co. $496,500

Wholesale groceries. About half the 45,000 sq. ft. 1-story masonry walled, steel-framed building was burned out by fire that originated on a 1,800 sq. ft. wooden balcony where paper tissues, wax paper and other light material were stored. Motors that operated the pneumatic tube communicating system were also located on the balcony which was in the middle of three sections into which the building was divided by unparapeted brick walls.

At 11:30 A.M. employees saw a bright flash in the vicinity of the balcony, followed by flames that mushroomed out beneath the steel deck of the roof. Stocks of brooms, matches, mops and other highly combustible materials stored on the floor near the balcony were quickly involved. Steel roof supports buckled and the built-up asphalt roof covering burned freely when ignited by heat from beneath and by flames that came out of roof ventilators. Asphalt melted in advance of the flame front and in some instances hot drippings ignited contents on the floor. The roof fire spread over the top of the unparapeted masonry wall to an adjoining section. Fire also entered this section through two unprotected windows in the intervening wall near the roof. (Doorways in the walls were protected by pairs of rolling type fire doors.)

Fire fighters, although called at once, were confronted with a fire that had involved most of the center section of the 3-section building and that was spreading along the roof. Because of the few hydrants in the vicinity, pumper relays were set up to supply a sufficient number of hose streams to contain and extinguish the blaze.

May 15, Lewiston, Idaho Mason-Ehrman & Co. $500,500

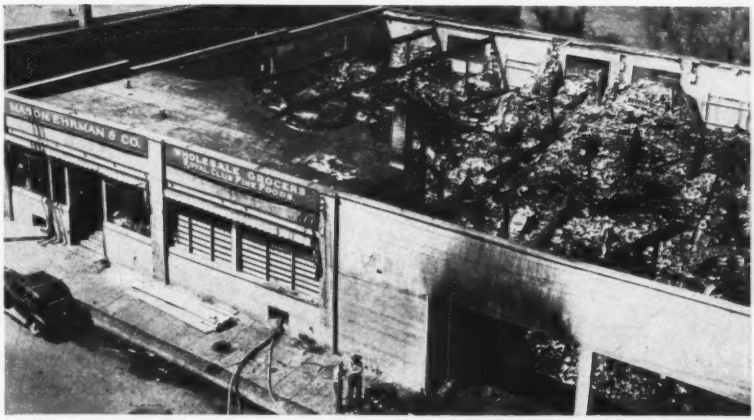
Wholesale groceries. At 9:16 P.M. the fire department received a telephone call from a service station attendant who reported that a "trash fire" some distance away which he had been watching seemed to be getting bigger and had better have fire department attention. Responding, firemen found that the supposed trash fire was in the grocery warehouse and that three-fourths of the undivided, 16,500 sq. ft., 1-story brick, plank-on-timber warehouse was involved. The unsprinklered building had not been open on the day of the fire (a Saturday) and no watchman had been provided. Origin was in the basement where stock was piled to the ceiling and in front of windows (which had steel bars).

***Sept. 7, Williston, N. D. Nash-Finch Co., et al. $270,500**

Grocery warehouse, grain elevator. A fault in a switch box in the basement was the probable cause of fire that destroyed the unsprinklered 9,600 sq. ft. 1-story brick, wood-joisted grocery warehouse and most of an exposed wood-framed, metalclad grain elevator containing 33,000 bushels of wheat. Although confined to part of the basement when discovered by the bookkeeper at 6:30 P.M., fire later spread up an open elevator shaft to the first story and roof. Smoke and boarded and barred windows prevented firemen from getting at the fire while it was confined to the basement. Heat and sparks were carried to a high, wood-framed, metalclad grain elevator across a railroad siding from the warehouse. When fire in the upper part of the elevator was finally noticed it was too late to save the building.

Nov. 27, Monroe, La. Commodity Credit Corp. $250,000

1,900 tons of rice. A grass fire, accidentally set by rabbit hunters, is the probable cause of fire that swept through this 10,000 sq. ft. unsprinklered combustible warehouse



Groceries stored in the basement, piled to the ceiling and in front of windows handicapped fire fighting in this unsprinklered grocery warehouse. Delayed detection was another factor in this May 15 fire in Lewiston, Idaho.

(wood covered with tar paper) loaded with 38,000 100-lb. sacks of rice. The walls were in flames when the first engine company arrived. An estimated 65 per cent of the rice could be reclaimed.

Dec. 10, Medford, Ore. Pinnacle Packing Co., Inc. $271,500

Packing materials, pears, jams for gift packages. At 1:12 A.M. police on patrol discovered fire beyond control in the 12,300 sq. ft. L-shaped 1-story masonry, wood-joisted combination office and warehouse.

Shangle Studio

Flames are shown breaking through the office section roof of the packing company property in Medford on December 10.

Despite ample water supplies and mutual aid assistance from surrounding towns the fire was so well advanced when discovered that the office was completely destroyed and the warehouse section fell into the basement.

The building was unsprinklered. Night watchman service was provided for several buildings in the neighborhood by a man who was apparently supposed to make more or less regular but unsupervised tours.

***Dec. 27, Fullerton, Calif. Eadington Fruit Co., et al. $1,250,000**

Four buildings used for fruit packing and storage. Fire that originated in the vicinity of a floor furnace in an unsprinklered 17,100 sq. ft. wooden fruit packing plant was beyond control in the undivided building when discovered by a passerby at 4:15 A.M. The exposure protection that under ordinary conditions could be expected to prevent spread to surrounding buildings was nullified by a 42 mph wind (gusts up to 65 mph). Three additional combustible buildings, separated from the building of origin and from each other by clear spaces of 55 ft. minimum width, were ignited by wind-driven heat and sparks, and destroyed.

Dec. 28, Lucerne, Colo. Weld County Certified Seed Potato Growers $300,000

30,000 sacks of seed potatoes. One of several oil stoves left lighted in this warehouse to prevent potatoes from freezing may have caused the fire that destroyed the unprotected 12,000 sq. ft. 1-story brick, wood-joisted building. The fire had made considerable headway when discovered by a passerby at 11:00 P.M. and was beyond control when fire fighters arrived from surrounding towns 30 minutes later.

Fur Storage

May 15, Toronto, Ont. Birkan's Fur Storage $503,000

Fur garments. A fault in an extension light was the reported probable cause of fire that damaged 5,280 fur garments (250 fire damaged, 5,030 smoke damaged) in the 25,000 sq. ft. 2-story fire-resistive fur vault. The vault was an independent structure not in or connected to a building. No watchman service or automatic fire protection was provided. Firemen, responding to an alarm at 1:15 P.M. telephoned by a passerby who saw smoke coming from vault doors, used two hydrant streams to extinguish the fire. Several firemen were overcome by smoke.

Glass Bottles

***March 18, Somerville, Mass. Cott Bottling Co. of Somerville, Mass. $2,000,000**

New bottles and bottled beverages, dwelling. Fire believed set by boys playing at one end of an unsprinklered 1-story wooden storage shed entered the shed and swept rapidly through its undivided 520-ft.-long interior. Attached to the shed, midway of its long axis, were two sprinklered wooden warehouses. Sprinklers in these buildings operated and to some extent protected the interior until the burning roofs collapsed and broke sprinkler piping. Adjoining and communicating with these sprinklered warehouses was the sprinklered, high 1-story brick, wood-joisted bottling plant. Except for portions of the wood roof on the exposed side, this building was not damaged by fire despite many unprotected openings in the wall between the destroyed sprinklered warehouses and the bottling plant. Fourteen sprinklers opened at conveyor openings and at two wired glass windows in roof monitors to keep fire from entering the bottling plant. A 3-story wooden dwelling a few feet from the building of origin was practically destroyed.

Oct. 24, Milwaukee, Wis. Blatz Brewing Co. $536,000

600,000 cases of beer bottles. Summoned to a fire discovered by police at 3:39 A.M., firemen found fire beyond control in the 18,750 sq. ft., 40-ft. high, 1-story combustible building. Formerly an ice house, the undivided building had been converted to a beer bottle warehouse and at the time of the fire was loaded to capacity with 600,000 cases of bottles. No private fire protection was provided.

Grain Elevator

***July 6, Bad Axe, Mich. Bad Axe Grain Co. $250,000**

Two grain elevators, two grain warehouses. Two elevators and two warehouses (4,000 sq. ft. and 2,400 sq. ft. in area) were destroyed by fire that had made considerable headway in one of the warehouses before being noticed by a neighbor at 10:55 P.M. The buildings were of combustible construction, were interconnected and were without automatic sprinkler protection, automatic fire detection equipment or watchman service. The fire took advantage of these weaknesses.

Hardware

Aug. 13, Dewitt Twp., N. Y. Rose, Kimball & Baxter Co., Inc. $302,500

Household appliances, sporting goods, paints, thinner, other hardware store stock. Substandard flammable liquids storage, poor stockpiling practices and failure to provide watchman protection and sprinkler supervision were notable factors responsible for this large loss.

The fire originated in a 5-ft.-high pile of cardboard cartons, containing about 2,000 gallons of turpentine, linseed oil and alcohol in bottles and cans. Two feet above the top of the pile of cartons was a wooden rack on which wooden stepladders were stored two to three feet high. The fire is believed to have been due to spontaneous heating in a carton of bottles of linseed oil. This

supposition is based on the fact that about 14 hours before the fire, when the cartons were being stacked, a few fell from a hand truck. Those with broken bottles were supposedly all removed to a safe location but it is possible that one of them escaped notice and was left in the pile.

Records of the water pumping station, four miles from the building, showed a sudden pressure drop of about 13 psi at 12:15 A.M. which is thought to have been caused by almost simultaneous opening of a large number of sprinklers in this property. However, because of the isolated location of the plant and the absence of sprinkler supervision and watchman protection, the fire was not reported until an unknown passerby noticed the fire and telephoned the fire department at 12:48 A.M. On breaking open the door, firemen found the 42,244 sq. ft. undivided interior of the 1-story noncombustible building filled with smoke, asphalt was dripping through the metal roof deck over an area of approximately 20,000 sq. ft., 157 upright spray sprinklers were operating, and the pile of cartons of flammable liquids and a small area of asphalt directly above the pile were burning. Using a 2½-inch hose with straight stream nozzle and 1½-inch hose with spray nozzle, firemen completed extinguishment. Actual fire damage was confined to a part of the pile of cartons where the origin fire occurred (about 400 gallons of flammable liquids were consumed) but most of the other stock in the building was severely damaged by smoke and water.

A plausible theory that has been advanced to explain why the fire was not readily controlled by one or two sprinklers suggests that the fire developed rapidly in the pile of cartons and very early (even before sprinklers overhead opened) caused several containers of flammable liquids to rupture. Thus, a hot fire immediately developed that generated a large quantity of hot gases which heated a large area of the roof covering and opened many sprinklers almost simultaneously. Although investigators recognized the fact that it was poor practice to store ladders as indicated, it is their opinion that the ladders did not seriously interfere with distribution of water from sprinklers.

Despite the resulting reduction in water pressure, the sprinklers were able to prevent serious spread of fire to other portions of the building.

Machinery

Feb. 21, Regina, Sask. Saskatchewan Power Corp. $475,000

Equipment warehouse. Fifteen hours after the last person left the 43,500 sq. ft. 1-story combustible building (wood walls, heavy timber framing, fibreboard interior finish and partitions), firemen were summoned by a passerby to a fire that was, by then, too large to be controlled by booster lines. Since the nearest hydrant was ¾ of a mile away, effort was concentrated on saving four adjacent dwellings. The latter were scorched but otherwise undamaged. The destroyed building had formerly been two military aircraft hangars.

April 1, LaSarre, Que. Provincial Department of Colonization $253,000

Storage and repair of tractors, bulldozers. While an employee was cleaning motor parts with a mixture of gasoline and oil, a spill occurred. Some of the liquid ran into the sewer drain. A short time later while he was grinding a piece of iron on a grindstone the gasoline on the floor ignited. The Provincial Fire Marshal, in his report of the fire, attributes the ignition to a spark from the grinding operation. While the employee attempted to stamp out the flames a flash fire occurred that quickly enveloped the interior of the 7,500 sq. ft. 1-story wood-framed, metalclad building.

July 24, Hampton Bays, N. Y. Aviation Supply Co. $1,000,000

Surplus aircraft engines and engine parts. A 200 foot square 1-story noncombustible building crammed with aircraft engines and parts was destroyed by fire that had involved the interior when firemen arrived. A bolt of lightning was the probable cause. The building was not sprinklered, was undivided and was apparently without watchman protection. The 20-hour fire was punctuated by explosions of magnesium.

Military

Nov. 11, near Edmonton, Alta. Canadian Government $1,100,000

Army general store, including clothing and barracks supplies. On Tuesday, November 9, a contractor's employee working at the gov-

This fire in Buffalo on March 12 (see report below) spread from its basement origin via open stair and elevator shafts in the unsprinklered 5-story warehouse.

ernment reservation damaged a water main that necessitated shut-off of water to hydrants in the vicinity of the warehouse and to sprinklers inside. At 11:06 A.M. on Thursday, November 11, one hour before the water supply was to have been restored, sparks from a welder's torch fell on a pile of waterproofed sand bags in Section 1 of the sprinklered 3-section 65,000 sq. ft. 1-story concrete block, steel-framed warehouse.

Reports indicated a serious delay in fire department notification as the welder's employer tried to extinguish the fire with a portable extinguisher. The fire had spread to much of the combustible contents of Section 1 when Army and Edmonton fire fighters arrived. Since there was no water available from hydrants near the building during the early part of the fire, firemen were unable to bring the blaze in Section 1 under control. When the roof collapsed, pulling down part of the concrete block fire wall between Sections 1 and 2, fire destroyed Section 2. The wall between Sections 2 and 3 cracked and fire doors bulged, but by then hose streams from hydrants three blocks away were in operation. Using these, firemen were able to keep the fire from Section 3. Sprinklers were placed in service as the fire was controlled.

Paper

March 12, Buffalo, N. Y., D. J. Mead & Sons $296,500

Wholesale paper distributor. On opening the building in the morning, an employee found the basement filled with smoke and called the fire department. A large part of the 5,200 sq. ft. basement of the unsprinklered 5-story brick, plank and timber building was in flames when firemen arrived.

Forced by smoke to attack the fire from outside, firemen were further handicapped by lack of windows in two walls. Fire spread via open stair and elevator shafts to upper floors of the heavily loaded building. Firemen were preparing to climb aerial ladders to the roof when forced back by smoke. Minutes later the wall collapsed.

*June 4, Lockport, N. Y. Western New York Container Corp. $250,000

Corrugated shipping containers. The warehouse and an adjacent factory building were destroyed by fire that had made considerable headway in the 1- and 4-story warehouse when noticed by the plant watchman at 5:18 A.M. The factory building was sprinklered

and protected by a watchman but this protection was not provided for the warehouse. Sprinklers supplied only by a 6-inch dead end street main were unable to prevent fire from entering the adjacent factory since fire department hose streams being used to protect several other exposures reduced the supply seriously. After additional fire fighters arrived from other communities, the fire department moved two pumps back two blocks to secure water from 8- and 10-inch mains and were able to halt further spread.

June 7, Jersey City, N. J. Colgate Palmolive Peet Co. $350,000

Cardboard packing material. The folly of storing combustible materials, in this instance, cardboard packing materials, in a building without watchman and sprinkler protection was again demonstrated when fire destroyed the three upper stories of the 8-story brick, plank-on-timber building. Fire was beyond control in the third story when employees on the first floor of an adjacent building smelled smoke that was coming through an open doorway at the first floor level. Double fire doors at all fire wall openings on upper floors prevented fire from spreading to the adjoining building.

Delayed detection gave this fire a big start in cardboard in Jersey City, June 7.

Petroleum

June 25, Los Angeles, Calif. Tidewater Associated Oil Co. $640,000; 1 killed

Marine terminal for petroleum products. Thirteen of seventeen storage tanks of 5,000

The sprinklered factory (far right background) was destroyed along with the unsprinklered warehouse structures in foreground and left rear in Lockport, N. Y., June 4. The fire entered the factory where water supplies for sprinklers were inadequate. Fire fighters used hose streams to protect other exposures. A six-inch dead end main was the sole source of water.

Wide World

The value of a Harbor Emergency Force was illustrated during this fire at the Tide Water Associated Marine Oil Terminal in Los Angeles Harbor (San Pedro, Calif.), on June 26. Admiral Frank D. Higbee, Port Warden and Chairman of the NFPA Committee on Harbor Emergency Organization, telegraphed the Association on the day of the fire that all vessels threatened were evacuated, that a buoyant oil boom was strung to confine any oil which might (but did not) escape into harbor waters, and that no docks or port facilities other than the tanks destroyed sustained damage.

to 55,000 barrel capacity in three adjoining diked areas were destroyed or damaged by fire that followed almost simultaneous explosions in two empty gasoline tanks that were being pumped out. The exploding tanks were adjacent to each other but were separated by a 14-ft.-high dike. Explosion of one of the tanks killed a gager on its roof and caused a small pipeline adjacent to the tank to rupture. Firemen using hose streams held in check the small ground fire at this break until a larger light oil line broke. Burning oil then spread rapidly on the surface of water (approximately 15,000 gpm were being utilized) and drove all firemen from the diked areas. The ground fire caused four tanks to rupture at their roof-to-shell seams. These tanks ignited as did another when the lead seals around its foam chambers melted out. Wind drift carried sufficient water from fire boat streams to floating roof of still another tank to cause the roof to sink. A week was required for complete extinguishment. For detailed report see NFPA Flammable Liquids Fire Loss Bulletin, Series 1954, No. 1.

Oct. 2, Memphis, Tenn. Esso Standard Oil Co. $1,500,000; 1 killed

Fire punctuated by repeated explosions seriously damaged and destroyed a group of ten barges being unloaded at the terminal. At the time the fire broke out, about half of their total cargo of 102,000 barrels of gasoline, cleaning solvents and diesel fuel had been unloaded. The fire originated in a barge unloading gasoline. It is reported that a flexible hose ruptured releasing gasoline that ignited at a diesel engine on the barge operating the discharge pump. The first of several explosions in cargo tanks followed almost immediately. Of the four men on the barge one jumped to a near-by towboat and two jumped or were blown into the river. These three survived but the body of the fourth was found three days later on one of the burnt-out barges. With fire rapidly involving all barges, fire fighters concentrated on protecting the adjacent petroleum products terminal. In this they were successful. By October 6, the last barge fire had been extinguished or had burned out.

Rubber

March 8, Buffalo, N. Y. Bison Waste & Wiper Co., et al. $1,264,000

Waste materials including foam rubber, baled rags. Fire that spread through the upper eight floors of the 20,000 sq. ft. 10-story reinforced concrete building originated in the third story (where 110,000 lbs. of foam rubber were stored) during building alterations. The warehouse was protected by sprinklers installed in 1907 according to 1905 standards for ordinary hazard occupancy. Water was supplied from a 50,000-gallon tank on the roof and through street mains. Because of building alterations, sprinklers on the fourth story and two bays

United Press

One life was lost in this oil barge fire in Memphis on October 2. The accident took place during gasoline unloading and several explosions occurred during the fire.

Harbor (San Pedro, Calif.), on June 26. Admiral Frank D. Higbee, Port Warden and Chairman of the NFPA Committee on Harbor Emergency Organization, telegraphed the Association on the day of the fire that all vessels threatened were evacuated, that a buoyant oil boom was strung to confine any oil which might (but did not) escape into harbor waters, and that no docks or port facilities other than the tanks destroyed sustained damage.

A. P. Wirephoto

This fire in a Buffalo, N. Y. warehouse on March 8 consumed some 300,000 pounds of foam rubber and other materials stored in the sprinklered fire-resistive building. The sprinklers were overpowered because a floor valve was shut off at the time the fire broke out. It was under control of other sprinklers plus hose lines until someone closed the valve during the fire fighting.

on the third story were shut off at the time the fire broke out. Welding sparks started the fire in an unprotected part of the third story. As the welder tried to use an extinguisher, only to learn that it was empty, flames spread to stacks of foam rubber. Many of the sprinklers still in service operated, and in conjunction with water from two 2½-inch hose streams brought into the smoke-filled room by firemen, the fire was confined to part of the third story when someone closed the valve controlling all sprinklers on the third floor. Flames spread rapidly to the piles of rubber forcing firemen to windows from which they escaped down ladders. Intense fire spread through many unprotected openings and via windows to upper floors. Because of the intensity of the fire and the many sprinklers that fused (280 per floor), sprinklers could offer little protection. The fire department sprinkler connection was hidden by an air compressor and a pile of concrete blocks, preventing firemen from pumping into the sprinkler system during the vital early stages of the fire. Two multi-storied exposures were each 50 ft. from the burning building and connected to it by overhead covered bridges. By throwing up strong water curtains, opening sprinklers on the exposed sides and by directing hose streams into the connecting passageways, fire fighters protected the exposed buildings from serious water damage.

See NFPA FIREMEN magazine (April 1954) for detailed report.

Terminal Warehouses

May 13, West Haven, Conn. Connecticut Motor Lines $251,000

Truck terminal. At 7:51 A.M. one of three oil-fired salamanders being used for heating purposes on the loading platform was accidentally tipped over igniting some canvas truck covers piled nearby. Instead of calling the fire department at once, employees attacked the blaze with several soda-acid extinguishers. Twenty minutes later, when the fire department was called, fire had spread into truck trailers backed up to the loading platform and had also entered the undivided and unsprinklered 9,000 sq. ft. 1-story brick, wood-joisted building through open loading doors. Fire spread rapidly, feeding on flammable liquids, fireworks, clothing and a wide variety of other combustible freight, and even before the first hose was charged, it was obvious that the truck terminal and the ten trailers and one tractor at the building could not be saved.

June 23, Shreveport, La. Kansas City, Southern Louisiana and Arkansas Railroad Co. $256,500

Railroad freight terminal. 28 box cars, 18 truck trailers, 6 trucks, 11 automobiles. The 23,360 sq. ft. U-shaped 1-story wooden building, the box cars and the trucks and truck trailers at loading platforms were destroyed by fire that broke out while a gasoline-powered lift truck was being refueled at a dispensing pump located on the loading platform. Backfire of another recently refueled gasoline-powered lift truck which was being started near-by was said to have caused explosive ignition of an accumulation of gasoline vapors in the vicinity. Employees attacked the fire with pails of water but could not prevent it from spreading rapidly along the loading platform and through doorways into the undivided and unsprinklered warehouse. Eleven automobiles parked beside the building were destroyed.

June 24, Charlotte, N. C. Southern Railroad Co. $400,000

Railroad freight terminal, 24 freight cars. At 9:30 A.M. a shipment of four drums of scrap motion picture film was placed on an open platform where it remained until 2:30 P. M. The drums were then taken inside. In the meantime, however, while exposed to temperatures in the nineties, the nitrate film in the drums had started to decompose. At 4:10 P. M. a hissing sound

Kugler's

Scrap motion picture film started this railroad terminal warehouse fire in Charlotte, June 24.

Jack Beers, Dallas Morning News

This second scrap nitrate film fire occurred at Dallas on July 15 and destroyed 20 truck trailers as well as the terminal. The other fire (above) at Charlotte, N. C., on June 24 occurred at a railroad terminal but the results were the same. Trailers are "dead ducks" in rapid spreading fires as shown here.

was heard followed by explosion of one of the drums that blew flaming nitrate film 50 ft. Fires started by the film spread so rapidly that employees had to leave at once. Although the alarm was turned in without delay the fire was beyond control when the first engine company arrived, because of two serious fire protection weaknesses — lack of sprinklers and lack of fire divisions for the 620 ft. by 169 ft. 1-story brick, wood-joisted building. Twenty-four freight cars on sidings beside and inside the building were also destroyed.

July 15, Dallas, Tex. Sunset Motor Freight Lines $288,500

Truck terminal, 20 truck trailers. Ignition of the decomposition products of scrap nitrate film was the reported cause of fire that destroyed the unsprinklered 120 ft. by 45 ft. 1-story brick, wood-joisted building. At 6:20 P. M., some of the 40 employees present noticed a hissing sound at one of the five old, rusted drums containing rolls of scrap nitrate film that had been standing on the loading platform during the afternoon. (Afternoon temperatures ranged from 101° F. to 106° F.) When the top of the drum blew off, flames leaped to the roof of the loading platform and spread so rapidly along the platform an into the building that employees were un able to use extinguishers. Employees starte to move tractor-trailers away but flame spread so quickly that 20 trailers were en veloped before they could be moved t safety.

Aug. 13, Jersey City, N. J. All States Freigh Inc. $566,000

Truck terminal, 17 trucks, 6 trailers. Th 5,000 sq. ft. 1-story brick, steel-frame freight terminal, 17 trucks and six trailer were destroyed by fire discovered in a pil of merchandise on the loading platform Fire officials believe they could have pre vented the extensive damage had employee called the fire department at once instea of first trying to put out the blaze with fir extinguishers. The building was no sprinklered.

Tobacco

***Jan. 12, Fayetteville, Tenn. Lincoln Loos Leaf Tobacco Co., et al. $270,000**

Two warehouses containing 150,000 lb of tobacco, 7 box cars. Two undivided an unsprinklered 1-story wood-framed, meta

clad warehouses of 63,448 sq. ft. and 71,670 sq. ft. area were destroyed by fire that originated in a small office in the rear of one of them. Since no watchman was provided, and since the office was concealed from sight of passersby, the fire had involved a large area before it was noticed by neighbors at 8:20 P. M. Flames helped along by strong winds, spread through the undivided building of origin and through a connecting wooden passageway to the adjoining warehouse. Seven box cars on a siding beside one of the buildings were destroyed. These cars acted as a shield and prevented heat from the warehouse from igniting warehouses on the other side of the siding.

Whiskey

***Aug. 4, Pekin, Ill. The American Distilling Co. $7,130,000; 6 killed**

91,100 barrels of whiskey in three bonded warehouses, bottling building. Fire that took the lives of six members of the private fire brigade and injured 30 other fire fighters broke out when lightning reportedly struck a 11,250 sq. ft., 68-ft.-high open rack

Wide World Photo

This $7,130,000 fire at Pekin, Ill. in a group of whiskey warehouses was the largest single storage loss of 1954. Believed to have been started by a stroke of lightning about 2:20 A.M. Aug. 4, the fire caused an explosion at 10:30 P.M. Aug. 5 which killed 6 fire fighters.

warehouse of brick, wood-joisted construction. Summoned by a plant watchman at 2:20 A. M., the private fire brigade and the Pekin Fire Department had hose streams in operation within a few minutes, but by then the alcohol-fed fire had involved the entire interior. Within a few minutes the building collapsed. About 30 minutes later heat from the intensely burning pile of rubble ignited a similarly constructed rack warehouse 75 ft. away. A short time later this building also collapsed and radiated heat ignited a 3,000 sq. ft. 3-story brick, wood-joisted bottling building 50 ft. from the two collapsed warehouses. This building was also destroyed. An intense fire continued to burn in the remains of the two collapsed buildings, but by 7:00 A.M. the fire seemed to be under control. The exposed wall of a 25,600 sq. ft. brick, wood-joisted rack warehouse, identified as "No. 52," 50 ft. from the collapsed buildings, was very hot but seemed to be holding the fire from entering. By noontime most of the mutual aid apparatus had gone home and the number of hose streams was reduced to four. At 3:30 P. M. the interior to building No. 52 was inspected and then locked up by government revenue men.

At 7:00 P. M. smoke was seen coming from roof vents of building No. 52. Firemen tried to enter but found the interior filled with smoke and alcohol vapors and were forced to leave. Mutual aid companies were again summoned and hose streams were directed at the blank walls and through doorways in one wall, but the smoke continued to thicken and at 10:30 P. M. a violent explosion demolished the building and scattered debris over a radius of 200 yards, damaging six other buildings. The deaths and most of the injuries resulted from this explosion. As soon as rescue work was completed all fire fighters were withdrawn several hundred yards and fire fighting was discontinued until 10:00 A. M. the next day. No other buildings ignited, due in part to the heavy rain that fell during the night, and by evening of August 5, the fire was under control.

Miscellaneous

Mar. 24, East Paterson, N. J. New Jersey Farm Supply Co-op. Assn. $325,000

Six sheds containing 780,000 baskets, 4,000 bales of peat moss, lumber, builders' supplies, 5 trucks, tractor. Four acres congested combustible sheds, the largest ft. wide and 220 ft. long, were swept fire that apparently originated as a gra fire and was not discovered until 4:34 P. M by an employee, when it was involving o of the sheds. Lack of adequate clear spac between buildings, poor water supplie strong winds and highly combustible co tents prevented the approximately 300 fir men that responded from East Paterson a neighboring towns from checking the spre before six buildings had been consumed.

May 9, New Westminster, B. C. Swa Wright Co., Ltd. $257,000

Furniture storage, radio broadcasting st tion and other storage and mercantile o cupancies. At 8:55 A.M. on a Sunday mor ing when most of the 4-story concrete fram wood-joisted building was unoccupied, fi was discovered by the presence of smok The exact origin could not be traced a because of the subsequent damage to t third and fourth floors no positive cau could be determined by later investigatio The alarm was given by telephone and t fire department found an intense fire in stor furniture, appliances in packing cases a paints. The radio station (CKNW) whi occupied the top floor, was forced off the a after their personnel discovered the fire. T top two floors of the building sustained gre damage.

June 23, Idaho Falls, Idaho Idaho Fal Bonded Produce & Supply Co. $259,00

Feed, grain, pumps, furnaces, meat pro essing and storage. Ignition of burlap ba by welding sparks was the most probable cau of fire that destroyed the 28,750 sq. ft. story brick, wood-joisted building. T fire was discovered at 12:22 P. M., when personnel except a few office employe were at lunch. With no one in the ar where the fire started (meat processing ar in rear of first story) and with no aut matic protection provided, the fire ma considerable headway before a passer saw the fire and gave the alarm. The fi spread with great rapidity through the u divided first story and via open stair a elevator shafts to the second story of t dusty building. The story of fire fightin can be summed up in the following wor of fire chief, "We didn't have a chance arrival; it was too far gone."

54 Store Fires in 1954

There were more "large loss" mercantile fires in 1954 than ever before! The 54 fires reported here causing a loss of nine lives, 149 injuries and $23,098,000 in property damage compare with 29 fires, 10 lives and $12,000,000 in losses in 1953.

As one would expect, a large majority (actually 81 per cent) of the store buildings involved were ordinary brick, wood-joisted construction. Three-quarters were multistoried structures. This type construction with the structural and fire protection weaknesses enumerated below is susceptible to large losses.

In all cases one or more floors were fire damaged and in 15 cases the fire spread to other buildings. The most prominent structural weaknesses responsible for the fire spread were open stairwells (noted in 27 instances), lack of fire divisions on the floor of origin (also true in 27 fires), nonfirestopped concealed spaces and open elevator shafts (9 fires each) and undivided attic spaces (8 fires). Other notable features of construction which influenced fire spread were sub-standard division walls, undivided basements, not-cut-off special hazard areas, and combustible fibreboard

This Newton, Iowa fire originated in the auto accessories store at left. Before this photo was taken, heat that spread through substandard fire walls ignited buildings on either side.

Poughkeepsie New Yorker

Burning tires were responsible for most of the smoke boiling out of the basement of this Poughkeepsie auto accessories store.

interior finish. Poorly constructed fire walls were a factor in the spread to exposed properties in eight mercantile districts.

Detection was delayed in 47 of the 54 store fires. In the two cases where automatic sprinklers were installed, the fires originated outside the protected areas and detection was left to chance discovery by outsiders. Seventy-two per cent of the fires originated when the stores were not operating. In the only case where watchman service was provided, the watchman was burned while trying to give the alarm due to rapid flame spread in a display of Christmas decorations. Of the 37 fires reported by outsiders, police on patrol were the first to see nine and police radio was used in five cases to alert the fire department.

Basements were the origin of 37 per cent of the fires reported which is a somewhat lower percentage than is evidenc by previous NFPA studies of store fir The normal ratio is about 42 per ce

It is ironic that in the Denver sup market where partial sprinkler protecti was provided in the basement, the f started in the attic. In the other spr klered building (Time Building in W nipeg) fire originated at a sign on t exterior wall and spread through unspri klered concealed ceiling and wall spac

Auto Accessories and Supplies

***Jan. 17, Newton, Iowa Western Auto A sociates, et al. $350,000**

Auto accessories, plumbing supplies, d cleaning, lodge rooms, apartment. Three joining 2-story brick, wood-joisted buildin were destroyed by fire that originated in automobile accessory store on the first flo of the middle building. Since the store w closed (Sunday) and there was no automa

protection, the fire was not discovered until an apartment occupant in an adjoining building smelled smoke at 3:00 P.M. When firemen arrived, the building of origin was so heavily charged with smoke that they could not enter. Hose streams directed to the interior had no appreciable effect on the fire that was by then raging out of control. Heat and smoke gradually filled the buildings on either side of the building of origin, entering the exposures through many pipe holes and joist sockets that extended through fire walls. About three hours after the fire was discovered, fire gas explosions occurred in the exposures and they were destroyed.

***Jan. 29, Sanford, N. C. Brown Auto Supply Co. $350,000**

Auto supplies, household equipment, tire recapping. Two adjoining 2-story brick, wood-joisted buildings, communicating through unprotected openings, were destroyed by fire that was coming from second story windows of the tire recapping department when discovered by a passerby at 12:45 A.M. Flames spread rapidly through unprotected doorways to all parts of the second story where the fire originated, and prior to arrival of mutual aid departments, had broken through the roof. Strong winds and flammable liquids contributed to fire spread.

***Feb. 27, Tulsa, Okla. Standard Parts Co. $320,000**

Automobile accessories, 31-apartment building. Sometime between 1:05 P.M., when the last person left, and 8:00 P.M., when a pedestrian saw flames coming through the roof, fire broke out in the unsprinklered 14,000 sq. ft. 1-story brick, steel-trussed building housing the auto accessories store. Since the building was without watchman or automatic protection, definite information on the time, place of origin and cause could not be definitely determined. However, the fire is believed to have originated near a large double unit gas-fired heater suspended from the metal lath and plaster on wood-joisted ceiling. The fire apparently entered the concealed space between the ceiling and wood roof deck where it developed undetected until it burned through the roof.

When firemen arrived, flames were enveloping the exposed wall of the adjoining 3-story brick, wood-joisted apartment building and had entered the third story through plain glass windows. One of the first hose lines laid was taken to the third story of the apartment building to commence extinguishing operations there while two others were used to supply an aerial ladder nozzle directing water on the roof fire. Attempts to take hand lines into the building of origin had to be abandoned because of heat and smoke and danger of being hit by materials that cascaded from balconies where they were stored. Masonry partitions, which might have changed the complexion of the fire considerably had they extended above the ceiling, served to prevent hose streams directed through windows from penetrating to the seat of the fire. The steel roof trusses collapsed at 8:30 P.M.

Sept. 7, Poughkeepsie, N. Y. Goodyear Tire & Rubber Co., et al. $260,000

Tires, auto accessories, TV sets, tire retreading, 2 apartments. A mostly 1-story masonry, wood-joisted building of approximately 11,500 sq. ft. area was destroyed by fire that originated in the not-cut-off boiler room in the basement. When his attention was attracted at 9:30 A.M. by the loud humming of the feed water pump for the high pressure boiler, the store manager attempted to go down to the basement but was driven back by smoke. Hastily summoned firemen were also forced out, and while they were putting on breathing apparatus, fire flashed through most of the building evoking dense clouds of smoke as flames fed on car and truck tires in the heavily stocked building. Several firemen, checking the two second-story apartments to be sure all occupants were out, were trapped by the fast spreading fire and had to be rescued. Fire was confined to the building of origin although smoke and water damage was suffered in exposed buildings. In an adjoining supermarket frozen foods were ruined when electric power had to be shut off to eliminate danger of electric shock to firemen from falling overhead electric wires.

Clothing and Dry Goods Stores

Jan. 8, Orange, N. J. McCrory's 5, 10 & 25¢ Stores, Inc. $314,500

Dry goods variety store. Fire that destroyed this unsprinklered and undivided 10,000 sq. ft. 1-story masonry, steel-joisted

An hour after this Kansas City, Kansas clothing store closed for the night, firemen were summoned by a passerby who noticed that the building was filling with smoke. When the front doors were opened fire enveloped much of the first floor. There was no private fire protection.

building originated in the basement. It had made considerable headway before discovery by a passerby at 10:26 P.M., three-quarters of an hour after the manager left the store. Dense smoke and lack of exterior entrances to the basement prevented fire fighters from making an effective attack on the fire in the basement where a heavy stock of combustible merchandise was stored in bins from floor to ceiling.

April 12, Terre Haute, Ind. Levinson's, et al. $458,500

Ladies' wearing apparel. At 8:55 P.M., five minutes after the last person left the store, boys passing the building noticed smoke at the front door and gave the alarm. Firemen found fire in the basement of t 3,450 sq. ft. unsprinklered 3-story bri wood-joisted building. In the face of hea smoke they attacked the fire from sta ways for 15 minutes before being forced withdraw as fire spread up through t building by way of open stairways and conditioning ducts not equipped with dam ers. About the only thing in the buildi that was saved was a portable insulated f containing accounts receivable. Two ho streams were kept on this file througho the fire. A wiring fault between the fi floor and the combustible fibreboard ba ment ceiling, or an overheated ballast on fluorescent light mounted flush on t ceiling were possible causes of the fire.

***July 3, Kansas City, Kans. Leader Clothing Co., et al. $650,000**

Clothing store destroyed; water and smoke damage to six other stores. The 8,000 sq. ft. 2-story clothing store section of a 10,500 sq. ft. 1- and 2-story brick, wood-joisted building was destroyed by fire discovered by an outsider at 6:53 P.M., an hour after the building had been locked up for the night. No automatic protection or watchman service had been provided. Fire was not visible when firemen arrived at the clothing store entrance, but the interior was heavily charged with smoke. When firemen broke open the front doors, an explosion of fire gases occurred and fire almost immediately enveloped that part of the first floor occupied by the clothing store. A masonry wall kept fire from the 1-story section occupied by two small shops.

Flames spread up open stairways to the second story and about an hour later the roof collapsed. The first and second floors of the clothing store fell in at 9:00 P.M. When the roof collapsed, joists that extended through a party wall pulled out of their sockets, leaving holes through which smoke spread to an adjoining store building.

***July 16, New Westminster, B. C. Army & Navy Stores $400,500**

Dry goods and hardware. At 3:20 A.M., fire fighters answering an outsider's alarm of fire, found that the upper part of the

Wide World

This fire originated in the basement! Twenty-one occupants in the 3-story mercantile-apartment building in Johnson City, N. Y. were aroused at 5:40 A.M., December 7 by an upper floor occupant and fortunately made their way to the street before open stairways became impassable.

unsprinklered 4-story brick, wood-joisted building was in flames and that the roof and top floor had already fallen in. Thirty minutes later the third and second floors had collapsed. Adjoining 1-story buildings were badly damaged when a wall fell on them. Because of the extent of fire on discovery and the total destruction there were no clues as to the point of origin and cause. However, there was no doubt that the absence of a watchman or automatic protection was responsible for the total loss.

Dec. 7, Johnson City, N. Y. Ben's Clothing Store, et al. $464,000

Clothing store, florist, barber shop, 7 apartments. At 5:40 A.M. an occupant of an upper floor apartment was awakened by smoke from fire that had originated in the not-cut-off boiler room in the basement. Fortunately, the heat and smoke had not as yet made open stairways impassable and all 21 occupants were able to escape. However, the fire had made too much headway in congested stock stored in the unsprinklered basement to be controlled by fire fighters. Smoke and heat prevented firemen from descending to the basement with hoses and the many combustible partitions prevented hose streams directed through small cellar windows, down stairways and through holes chopped in the floor, from reaching the flames. Fire eventually spread up open stairways and through the roof of the 4,275 sq ft. 3-story brick, wood-joisted building. After arousing the occupants, the person who discovered the fire ran to a fire station 1,000 ft. away to give the alarm although a fire alarm box was 40 ft. from the building.

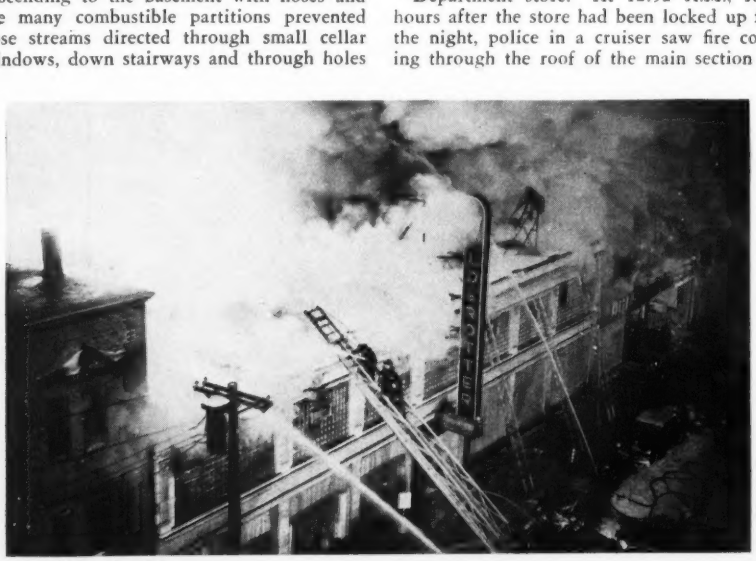
Dec. 28, Texarkana, Texas Wommack's Clothing Store, et al. $265,000

Clothing, shoe stores. At 8:45 A.M., a employees were assembling for the day's business, one of them smelled smoke and gave the alarm. Firemen traced the smoke to its source, a fire in the concealed space between the roof and top floor of the 2-story brick, wood-joisted building. Before the ceiling could be pulled, flames had spread through most of the undivided concealed space and had broken through the roof. Fire damage was confined to the roof and top story.

Department Stores

Jan. 14, Newark, N. J. W. Wilderotter & Co. $703,500

Department store. At 12:52 A.M., four hours after the store had been locked up for the night, police in a cruiser saw fire coming through the roof of the main section of



Newark Evening News

Flames were coming through the roof of this unsprinklered Newark, N. J. department store when discovered by police four hours after the store closed for the night. Fire spread above suspended ceilings and through unprotected doorways.

Associated Press

Contrary to the usual large loss fire experience in stores, this one in Zion, Illinois originated when customers and clerks were present. The fire started in an unoccupied stock room and spread rapidly through the unsprinklered 23,000 sq. ft. 2-story wooden building as the occupants scampered to safety.

the 1- and 2-story 40,000 sq. ft. brick, wood-joisted building. Firemen advanced fire hose lines part way into the building but were forced to leave when the suspended ceiling started to collapse. The main section was formerly a sprinklered bus garage but at the time of its conversion to department store usage the sprinkler protection had been discontinued. Flames spread rapidly from the main section and through unsprinklered 1- and 2-story additions by means of unprotected doorways.

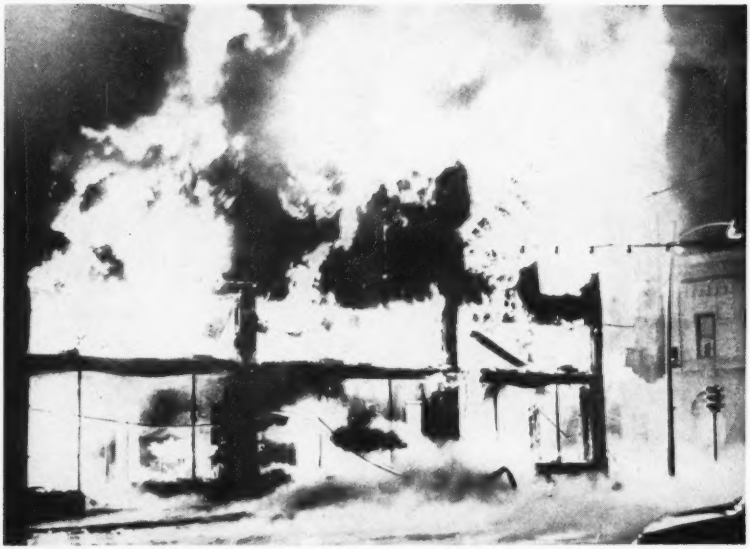
***Feb. 6, Zion, Ill. Zion Industries, Inc., et al. $692,000**

Sixteen buildings occupied by stores, curtain factory, bowling alley, auditorium. Originating in an unattended stock room on the second floor of a 23,000 sq. ft., 2-story wooden department store, fire destroyed or damaged 16 buildings. Clerks and customers fled safely as fire spread rapidly through the building of origin. Shortly after 7:45 P.M., when the first of Zion's two pumpers arrived, the fire was of such intensity that help was immediately requested from all fire departments within a 50-mile radius. Two additional pumpers were on the scene by 8:15 P.M. At that time the building of origin was in flames and sparks and heat carried by a stiff wind had ignited a 2-story brick, wood-joisted curtain factory across a 112-ft.-wide street. Eventually 38 pumpers were in service at the fire. During the first hour hydrant-connected pumpers were able to supply 5,000 gpm to hose streams. At 9:15 P.M., however, the town's 100,000-gallon elevated storage tank (supplied by a 500 gpm pump) went dry, and thereafter most of the water used had to be relayed from a lagoon, a private water supply and from a 50,000-gallon cistern.

The intensity of the department store fire diminished by 9:30 P.M. and thereafter fire fighting could be concentrated on checking further spread of fire across the street which by then had involved three buildings on either side of the curtain factory. At 11:00 P.M. the fire was under control.

March 13, Westminster, Md. J. C. Penney Co. $250,000

Department store. A malfunctioning oil burner was the determined cause of fire that destroyed the 7,200 sq. ft. 1-story brick, wood-joisted building. The factors responsible for the total destruction could also be determined: not-cut-off boiler room, lack of sprinklers, no automatic fire detection equipment or watchman, open stairway. Noting the above combination of fire protection weaknesses, it is not surprising to learn that the building was beyond saving when a passerby gave the alarm at 5:00 A.M.



United Press

Believe it or not 12 occupants of third story apartments escaped before fire gases ignited. By the time firemen were on the scene, flames had enveloped the entire Rugby, N. D. department store building.

R. D. Smith

Lack of watchman service and automatic fire protection allowed fire to involve most of the second floor of this Danville, Illinois department store before discovery.

March 25, Rugby, N. D. Jacobson's Department Store, et al. $600,000; 1 killed

Department store, shoe store, five offices, telephone exchange, five apartments. At 7:20 P.M., tenants on the third floor smelled smoke, and on investigating, found the hallways and stairways filling with smoke. The 12 occupants of the five third-story apartments were able to get out safely although some had to be helped through the smoke-filled hallways. Shortly thereafter, the fire gases exploded and by the time fire fighters were on the scene, the unsprinklered 11,250 sq. ft. 3-story brick, wood-joisted building was aflame from basement to top story. The fire originated in the basement, but because of the total destruction of the building, the cause could not be determined. The owner of an adjoining repair garage died of overexertion while removing some of his belongings. A firewall saved the garage.

Mar. 26, Midland, Mich. J. C. Penney Co., et al. $500,000

Department store, offices. At 1:38 A.M. a neighbor was awakened by smoke from fire in the adjoining 2-story brick, wood-joisted building housing a department store on its first floor and offices on the second. The fire had originated in the basement but before discovery and arrival of firemen had spread up an open rear stairway to the second story, through the second story via a long hallway, and had broken through the roof. No automatic protection or watchman service was provided.

Mar. 30, Wagener, S. C. Tyler Bros. $260,000

Department store. Destruction of this 13,200 sq. ft. 1-story brick, wood-joisted building can be traced directly to the owners' failure to provide automatic protection and watchman service. The fire originated in the receiving room and had entered the undivided attic before discovery by a neighbor at 9:00 P.M. Suspected cause of the fire was faulty electrical wiring. Three other towns gave mutual aid to the local fire department in combating the fire.

***Sept. 11, Arkansas City, Kans. Montgomery Ward Co., et al. $357,000**

Department store, apartments, small retail stores. Fire that destroyed the unsprinklered 7,500 sq. ft. 3-story brick, wood-joisted building had control of the entire basement when the fire department was notified at 8:20 P.M. —despite the fact that the store was open during the evening. When smoke was smelled by customers and clerks on the first floor everyone left the building, but there must have been, in the opinion of the fire chief, a delay before anyone thought to notify his department. Investigation showed that the fire started in a stock room in the basement which was crowded with newly arrived stock. A pendent light cord was the first burning object observed and it is presumed that the cause was an electric defect above a false metal ceiling. Flames communicated to the stock.

Firemen fought a losing battle to keep fire in the basement as flames spread to upper floors through open stairs, within nonfire-stopped walls and above suspended ceilings. The fire was intensified by tires, flammable liquids and other combustible stock stored in the basement and on display on the three sales floors. When the fire reached 350 gallons of anti-freeze stored in cans in the second story hallway fire fighters had to give up their efforts to keep fire out of the third story.

Fire entered the basement of an adjoining building through a blocked-open fire door in the party wall. Fire in the exposure was confined to the basement. Water and smoke damage in surrounding buildings was heavy.

Nov. 12, Danville, Ill. Sears, Roebuck & Co. $350,000

Department Store. The value of adequate manpower, equipment and water is to a large extent lost when a fire is not discovered promptly. This was the case when the Danville Fire Department answered an outsider's alarm at 6:50 A.M. for fire in this department store. The windows in the second floor had already blown out and fire had involved most of the unsprinklered and undivided 12,600 sq. ft. second story. The roof and the top story of the 2-story building were destroyed and parts of the second story dropped into the first story.

Nov. 21, Lock Haven, Pa. J. C. Penney, et al. $900,000

Department store, two other stores, five offices, three apartments. This unsprinklered 3-, 2- and 1-story building (built as three separate buildings but later converted to one building when openings were cut through the walls) was destroyed by fire discovered by a few employees in the building Sunday afternoon readying stock for the Christmas season. When discovered, the fire

Wide World

This Lock Haven, Pa. department store fire originated in an open trash bin. Had the building been sprinklered or had the employees who discovered the fire given the alarm at once this $900,000 loss might have been prevented.

was confined to an open trash bin in the first story. The fire might possibly have been confined to the bin had the fire department been called at once instead of 15 minutes later after employees had tried without success to put out the fire with five fire extinguishers. Flames went up an open stairway before firemen arrived and had involved most of the second story. On entering concealed spaces in the walls and ceilings, fire spread considerably before breaking into the open at widely separated locations.

Investigators concluded that the fire was due to overheated wiring directly above the open trash bin. Hot metal parts are supposed to have dropped into the bin.

***Dec. 4, State College, Pa. O. W. Houtz and Son $517,000**

Department store, garage. A fault in wiring for a Christmas display was the probable cause of fire that destroyed the unsprinklered 34,600 sq. ft. 2-story masonry wood-joisted department store building and an adjoining garage. When discovered by the watchman at 7:15 P.M., an hour and 15 minutes after the store closed, the fire was confined to the corner of the first floor housing the display. As the watchman gave the alarm by telephone, flames flashed so rapidly through Christmas decorations and a large stock of merchandise on the undivided first floor that he was slightly burned as he fled from the building. Open stairways, combustible fibreboard finish and lack of any division walls and a party wall were structural deficiencies.

Dec. 16, Bethesda, Md. Woodward & Lothrop Co. $350,000

Department store. No watchman or automatic protection was provided to assure prompt discovery and control of fire should one break out in this store during nonoperating periods.

Because of this oversight the store was destroyed at the height of the Christmas shopping season. The fire originated in a basement storage room where it burned for an estimated four hours before discovery by two police in a cruiser. Newspapers report that the policemen's attention was caught by a flaming Santa Claus in the store window, which they believed to be a spectacular advertising device. As they were looking at it, however, an explosion of fire gases occurred that broke display windows. Flames then spread rapidly throughout the 6,000 sq. ft. first floor and up open stairways to the second story of the 2-story brick, wood-joisted building. With the help of mutual aid departments the Bethesda firemen were able to save an adjoining Five and Ten Cent Store.

Furniture Stores

***Jan. 25, Aurora, Ont. Thompson's Furniture Store, et al. $250,000. 1 killed.**

Furniture, hardware, drugs, groceries, restaurant, apartments. One man was killed and two buildings were gutted by fire that first made itself felt by a violent explosion that blew out furniture store windows on the first floor of a 2-story brick, wood-joisted building at 9:00 A.M. On hearing the explosion, two furniture store employees on the second floor started downstairs but were forced by fire and smoke at the first floor level to return and take the freight elevator to the basement. Prior to the explosion, a dishwasher in the adjoining restaurant saw smoke coming through a hole in the wall and went upstairs to warn occupants of an apartment. All escaped before fire enveloped the building, but one who returned for personal belongings was fatally injured trying to escape the second time.

Jan. 30, Muskegon, Mich. Home Furniture Co. $353,500

Furniture. With no watchman or automatic protection provided, detection of any fire that might break out when this store was closed was left to chance discovery by a passerby. In this instance a policeman on his beat noticed that the building was filled with smoke and gave the alarm at 10:33 P.M. As the firemen approached the front door

No fire was visible in this Muskegan, Ill. furniture store when firemen arrived but the unsprinklered building was heavily charged with smoke. Flames immediately enveloped all floors when fire gases exploded. Fire walls assisted by the deluge gun and hand line shown in the photo kept flames from adjoining buildings.

Wide World

Five persons were killed, 26 injured by a propane gas explosion which occurred in the basement of a furniture store in Goldsboro on April 12. The gas escaped from a 40-year-old gas piping system in the street and seeped into the basement.

a muffled explosion occurred, followed almost immediately by a second more violent explosion of fire gases that blew out all windows in the 10,000 sq. ft., 2-story building, and broke 23 windows in a building across the street. After the second explosion, flames were visible from basement to attic. The burst of flames and heat accompanied by the explosion threatened to ignite a ladder truck and pumper in front of the building. This equipment was relocated and firemen were getting their first hose streams in operation when overhead 7,200 volt wires fell to the street forcing them to flee. Local firemen assisted by mutual aid companies managed to keep the fire from spreading to buildings facing the front and rear. Firewalls were an important factor in saving the buildings adjoining either side of the furniture store.

Mar. 13, Gary, Ind. City Furniture Co. $277,000

Furniture store, 20 apartments. Overloaded wiring above a suspended combustible fibreboard ceiling in the basement was the probable cause of fire that destroyed th unsprinklered 75 ft. by 125 ft. 2- and 3-sto brick, wood-joisted building. The area the basement where the fire started was use to display 12 rooms of household furnitur The fire is believed to have smoldered in th concealed ceiling space for some time befo the owner of the store across the stre noticed smoke pouring from the baseme and first floor at 5:32 P.M. Occupants the 20 apartments on upper floors we safely evacuated by firemen before fire sprea through pipe shafts to upper stories. previous fire in July, 1952 in this buildin caused 2 deaths.

***April 12, Goldsboro, N. C. Edwards an Jernigen Furniture Co., et al. $250,00 5 killed**

Furniture store, furniture warehous three multiple occupancy mercantiles. Fiv persons were killed and 26 were injured b an explosion of propane gas that originate in the basement of a 3,000 sq. ft. 2-sto brick, wood-joisted furniture store. Th building of origin and three adjacent build

ings were leveled, a fifth was damaged and fire immediately spread through all five. Explosion damage was inflicted on 83 other buildings. An investigation by the U. S. Bureau of Mines concluded that propane had leaked from a 40-year-old gas distribution system and had seeped through the earth, then through abandoned sewer and water pipes into the basement. In 1951 losses of the gas distribution system were 38 per cent. Subsequent repair of a number of leaks had reduced losses to 26 per cent.

Several months prior to this explosion local legislation was adopted requiring the gas company to discontinue use of this underground distribution system as rapidly as possible. The gas company was converting customers to "bottled gas" service. Immediately following the explosion of April 12, the gas company discontinued all underground gas distribution service.

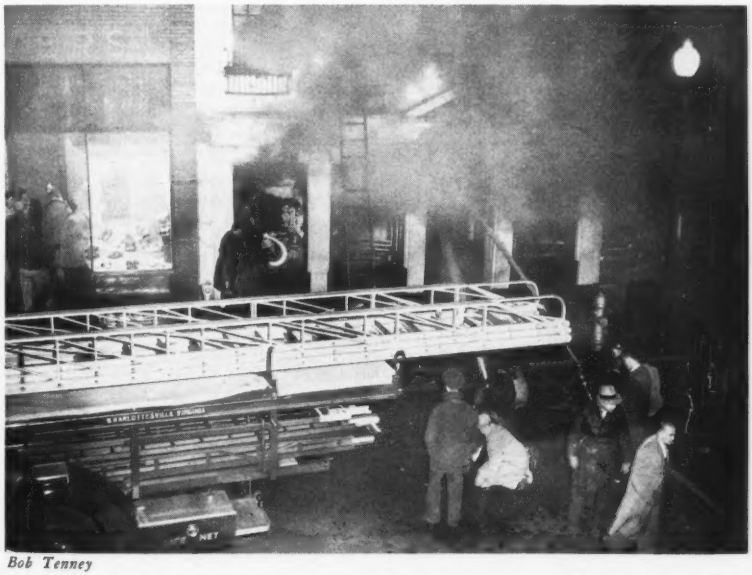
April 20, Omaha, Nebraska State Furniture Co. $530,000

Retail furniture and clothing. At 3:00 P.M., fire broke out in the shipping room in the rear of the first story of the 4-story brick, wood-joisted building. Although an employee was in the room to discover the fire and give the alarm promptly, flames spread rapidly over crated merchandise and were extending up an adjacent open elevator shaft when firemen arrived. Fire department investigators are probing the possibility that the fire may have been set. Whether it was accidentally started by a cigarette or match tossed into the open trash container or whether it was purposely set, the principal factors contributing to the extensive damage were the absence of sprinklers and an open elevator shaft.

Multiple Occupancies

Jan. 11, New York (Queens), N. Y. Grove Realty Co., et al. $250,000

Stores and offices. The three stores occupying the first floor of this unsprinklered 2-story brick, wood-joisted building and several of the offices on the second floor were damaged by fire that had made considerable headway before discovery by a passerby at 7:41 P.M. On arrival firemen found the building heavily involved.



Bob Tenney

Eighteen "large loss" store fires started in basements in 1954. This fire in a multiple occupancy mercantile building in Charlottesville, Va. was one of them. The basement was not sprinklered, and there was no watchman.

Feb. 13, Newburyport, Mass. Abraham Edelstein, et al. $300,000

Stores, offices. A cracked chimney was the reported cause of fire that destroyed the unsprinklered 3-story brick, wood-joisted building. Either heat or sparks from a fireplace fire in the top story is believed to have escaped from the cracked chimney into the attic igniting near-by combustibles. The fire which developed in the attic was undetected for several hours prior to being noted by a policeman at 4:47 A.M. Fire walls saved exposures.

Feb. 13, Charlottesville, Va. Brown's Gift Shop, et al. $261,000

Gift shop, ladies' apparel, variety store. Four hours after the building had been locked up for the night, passersby noticed that it was filling with smoke and called the fire departmenut. On arrival, firemen found the basement engulfed in flame and fire well advanced on the first floor. Numerous unprotected openings allowed the fire to spread up through the 5,250 sq. ft. unsprinklered 3-story brick, wood-joisted building. Because of a poorly constructed party wall, in which joists for both buildings abutted, the adjoining building was in serious danger of ignition. Firemen, posted in the exposure with hoses, kept fire from entering but the resulting water damage was heavy.

March 25, Atlanta, Ga. Atlanta Book Store, et al. $360,000

Book sales, storage and shipping, piano sales and repair. Lack of sprinkler protection and watchman service were the fire prevention weaknesses primarily responsible for destruction of this 7,500 sq. ft. 5-story brick, plank-on-timber building. Employees working late who smelled smoke but did not notify the fire department are, of course, subject to criticism, but their oversight does not compare in seriousness with the property management's oversight in not providing strong private fire protection.

At 11:18 P.M., March 24, piano company employees working late smelled smoke but on investigating the piano company premises (basement and first story) and finding no trace of fire, they went home. At 12:01 A.M. an explosion of fire gases blew out one wall of the fourth and fifth stories occupied by book storage. Following the explosion, fire spread rapidly through the ope stair and elevator shaft to all stories. Eleve hand lines, eight deluge sets and one la der pipe were used successfully to prevei spread to exposures 12 and 50 ft. away.

***April 29, Rapid City, S. D. State Emplo ment Service, et al. $273,000**

Offices, furniture sales and storage, ne car storage, variety store, used car lot. Co gested combustible construction witho division walls and other adequate means fo limitation of fire spread allowed fire t destroy four wooden buildings housing var ous occupancies. The fire originated in rear office on the first floor of a 2- and story wooden building with ground floo area of approximately 21,000 sq. ft. Th building was without watchman service an automatic protection, fire protection weak ness that permitted the fire to spread throug much of the building before discovery by passerby at 1:00 A.M. The absence o watchman service may also have been re sponsible for the start of the fire since cit and state fire officials concluded that boy had probably entered the building durin the evening and started the fire throug careless smoking.

From the building of origin, fire sprea to an adjoining 2-story wooden and bric building and also crossed a narrow alley i the rear to two wooden warehouses. Twent cars in the used car lot adjacent to the ware houses were destroyed before the fire wa checked.

***May 30, Batesville, Miss. C. E. Flint an Son $500,000**

Five stores, five offices. Five 2-story build ings were destroyed by this fire that was be yond control in the wooden building in whic it originated when discovered by a neighbo at 3:00 A.M. Since a report of the fire coul not be obtained from Batesville fire officials details cannot be presented to explain why th fire spread to neighboring buildings.

***June 3, England, Ark. Sterlings 5 and 1 Cent Store, et al. $400,000**

Six buildings, nine stores and one office When first seen by a passerby at 9:50 P.M., fire was burning on a display counter in the rear of the first floor of an unsprinklered 2-story brick, wood-joisted building. Before it was brought under control five hours

Irving Goodman

On June 8 in Winnipeg the largest mercantile store fire of 1954 originated behind an outdoor neon sign on the sprinklered 7-story brick, wood-joisted building, the remains of which stand in the left background. Flame entered and spread through nonfirestopped wall and ceiling spaces.

later, two 2-story, two 1-story and one 1- and 2-story brick, wood-joisted buildings had been destroyed and a 1-story brick, wood-joisted building had been slightly damaged. Twelve-inch brick walls with 12- to 18- inch parapets separated all buildings. Several factors were responsible for the widespread destruction, including delayed discovery (no watchman or automatic protection), poorly maintained fire apparatus (one pumper operated in "spurts," the other failed due to engine trouble) and substandard exposure protection (low parapets on some fire walls, crumbling of some walls under fire attack and ignition of a wooden cooling tower on the roof of an exposed building by radiated heat).

***June 8, Winnipeg, Manit. Time Building, et al. $2,500,000**

Four store and office buildings destroyed, one damaged. The worst fire in the history of Winnipeg broke out at the height of a windstorm in which velocity of south and southwest winds ranged from 52 to 72 mph. At 1:18 A.M. firemen, responding to a policeman's alarm, found fire burning behind a large neon sign on the outside of the second story of the sprinklered 10,750 sq. ft. 7-story brick, wood-joisted Time Building. Two clothing stores were on the first floor, 73 offices above. It was soon discovered that the fire had entered non-firestopped walls and ceiling spaces and was spreading through these spaces out of range of sprinkler protection and hidden from ready control by hose streams. It was not until 1:30 A.M. that the sprinklers opened. By then the fire had gained so much headway in the labyrinth of concealed spaces that it overpowered sprinklers when it broke out on upper floors.

The flames soon broke through the roof, but despite severe difficulties in maneuvering ladders and directing hose streams because of high winds, firemen confined the fire to the building of origin until 5:50 A.M. when the east wall collapsed into a side

street. Intense heat almost at once ignited the 5,580 sq. ft. unsprinklered 3-story brick, wood-joisted Dismorr Building, across the 66-ft.-wide side street. From here fire entered through unprotected openings the adjoining unsprinklered 3-story brick, wood-joisted Edwards Building. At. 6:00 A.M., the west wall of the Times Building collapsed on a 5,160 sq. ft. unsprinklered 2-story brick, wood-joisted building. It was immediately enveloped in flames. At almost the same time, radiated heat from the fire, now raging on all floors of the Dismorr Building, ignited the roof and upper floors of an unsprinklered 5-story brick, wood-joisted building to the north across a 20-ft.-wide alley.

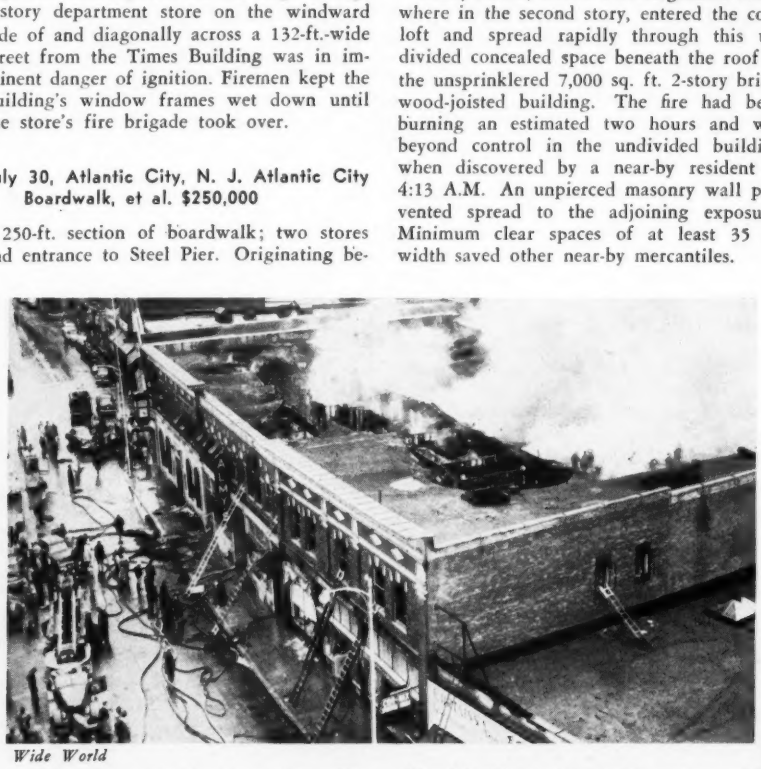
Further spread was halted by fire department hose streams (36 2½-inch and 3½-inch hoses), fire walls with protected openings and clear spaces. At one stage a large 8-story department store on the windward side of and diagonally across a 132-ft.-wide street from the Times Building was in imminent danger of ignition. Firemen kept the building's window frames wet down until the store's fire brigade took over.

July 30, Atlantic City, N. J. Atlantic City Boardwalk, et al. $250,000

250-ft. section of boardwalk; two stores and entrance to Steel Pier. Originating beneath the boardwalk, fire came up throug cracks between planking and spread to tw store fronts on the land side of the boar walk and to the entrance to the Steel Pie on the water side. Operation of automati sprinklers prevented spread of fire beyon the entrance of the Steel Pier. The estimate 5,000 people attending shows and exhibit at the pier remained where they were o were led to the beach and boardwalk b side entrances. While walking his beat, policeman smelled smoke from fire beneat the boardwalk at 5:45 P.M. While he wa telephoning the alarm, flames burst u through cracks in the planking.

Aug. 10, Beverly, Mass. Mason Buildin $1,000,000

Bank, offices, stores. Fire originated some where in the second story, entered the coc loft and spread rapidly through this un divided concealed space beneath the roof o the unsprinklered 7,000 sq. ft. 2-story brick wood-joisted building. The fire had bee burning an estimated two hours and wa beyond control in the undivided buildin when discovered by a near-by resident a 4:13 A.M. An unpierced masonry wall pre vented spread to the adjoining exposure Minimum clear spaces of at least 35 ft width saved other near-by mercantiles.



Wide World

This fire in a Beverly, Mass. store, office and bank building originated in and spread through the undivided space between the roof and top story ceiling.

Kenneth Colburn

Originating in a meat market, this Easton, Md. fire spread to other stores by burning through wooden partitions and joist sockets in brick walls.

***Aug. 11, Easton, Md. Peoples Meat Market, et al. $250,000**

Meat and groceries, shoe repair, auto supplies, department store, offices. What were described as five buildings, but which because of certain structural weakness would be considered one fire area, were destroyed by fire that originated at a compressor motor in the rear of a meat market. Since no automatic protection or watchman service was provided, the fire was beyond control when discovered by police at 2:30 A.M. Fire spread through a concealed ceiling space in the 1-story section housing the meat market and spread to other sections (1, 2 and 4 stories high) by burning through wooden walls and passing through joist sockets in brick walls.

Aug. 27, 1954, Parkersburg, W. Va. McKinney Building $256,000

Stores, apartments, lodge rooms. Fortunate discovery of the fire by police at 1:20 A.M., before it had spread out of the basement, allowed all occupants of the second story apartments to escape safely. Soon after the alarm was given, flames extended up open stairways and to upper stories of the L-shaped, 10,000 sq. ft. unsprinklered 3-story brick, wood-joisted building. During the fire, a 2-inch gas pipe in the basement ruptured, releasing gas that burned for an hour until the street was dug up and the corroded valve in the curb box shut off with a pipe wrench.

Dec. 6, Binghamton, N. Y. Western Union, et al. $293,000

Offices, stores, small manufacturers. Destruction of the 6-story brick, wood-joisted building is another example of the results that can be expected from a basement fire when the basement is unsprinklered, when the fire is not discovered promptly and when there are unprotected vertical openings through which fire can spread to upper stories. It was not until 3:42 A.M. that a policeman noticed this fire, by which time it had spread out of the basement and was going up through the building through an open elevator shaft, pipe shafts and non-fire-stopped walls.

Dec. 16, Orange, Mass. Mann Block $500,000

Five stores, beauty parlor, bank, court, six apartments, several offices. Fire that destroyed all but one wing of this large, 3-story brick, wood-joisted structure originated in the base-

Associated Press

Basement fire, no sprinklers, delayed detection, unprotected vertical openings — $293,000 loss in Binghamton, N. Y.

Minneapolis Star

A lesson in exposure protection was given by this October 25 fire in Minneapolis. Fire doors at openings to the adjoining sprinklered building and wired glass windows on the fifth story were major factors with eight sprinklers effectively holding back the flames where one door did not work and heat penetrated the windows.

ment of a hardware store when an employee tossed a lighted cigarette into a sink. Since it was the practice to dispose of waste thinner and turpentine by pouring it into the sink, it is presumed that the cigarette ignited flammable vapors in the sink. The sink drain is believed to have been clogged.

The flash fire at the sink spread so rapidly through basement hardware stock and up an open stairway to the sales area that one of the two employees in the store was burned fleeing the fire. Smoke rapidly filled the building and stairways and hallways became impassable minutes after 21 Brownie Scouts hastened down open stairways from a Christmas party on the top floor.

Repeated explosions of hardware stock and fire gas explosions made interior fire fighting impossible. Within five minutes of the alarm fire had reached the top floor. Three fire walls extended up through the buildings. Much to everyone's surprise these walls did not confine the fire. Investigation revealed that there were more than a dozen doorways and other openings that had been made in two of the walls and that these openings had later been concealed by sheathing. The third wall, with no concealed openings, saved one section.

Restaurants

Sept. 11, Los Angeles, Calif. Alexander B. Perino $300,000

Restaurant. Fire discovered by a passerby at 3:05 A.M. spread from the linen room to the bar and caused smoke and heat damage to the dining areas in the unsprinklered 1-story brick, wood-joisted building. The fire is attributed to a smoldering cigarette gathered up with the linen. During the evening soiled linen was placed in a closed metal container but at closing time the bartender emptied the night's accumulation into a laundry bag and left it in the linen room.

Oct. 25, Minneapolis, Minn. Hale Building $537,500

Three restaurants, six stores, one office. At 1:36 A.M., an occupant of an all-night lunchroom noticed smoke issuing from the 3-story brick, wood-joisted building across the street. On entering the first story, firemen could see no fire but it soon became evident that the building could not be saved when flames were heard burning in the basement and spreading through nonfirestopped

walls to upper stories. Fire also spread up open stairways. Eventually the floors and the roof collapsed. With no automatic protection or watchman service, the results were just about what could have been expected.

All fire doors at openings to the adjoining sprinklered 5-story building closed automatically. With one exception these doors kept the fire from the exposure. In this instance, the single fire door partly opened when supporting brick work fell. Six sprinklers held the fire in check at this opening. Heat that penetrated a wired glass window in the fifth story of the exposure caused two sprinklers to operate.

Dec. 15, Bayside, Wisc. Arthur T. Kammann $250,000; Two killed

Restaurant. Two of six employees of this fashionable restaurant asleep in their second-story quarters lost their lives in fire that destroyed the 2-story stone, wood-joisted building. The other four escaped through second-story windows. The fire originated in the kitchen and had made considerable headway before being seen by a passerby at 4:55 A.M. Fire equipment, man power and water supplies were adequate but by the time fire operations were commenced two lives had been lost and the fire was beyond control.

Dec. 26, Tucson, Ariz. Paulos Cafe, et al. $250,000

Restaurant, leather goods, venetian blinds. At 11:40 P.M. (Sunday) a violent explosion blew out glass block and brick from the front of the restaurant occupying most of the first story of the unsprinklered 6,100 sq. ft. 1- and 2-story brick, wood-joisted building. On arrival, firemen found the interior of the restaurant in flames, smoke coming from cracks in a side wall and a considerable number of bricks on the sidewalk. The fire soon had complete control of the building and efforts were made to save exposures. Fire spread into the basement of an adjoining building around a substandard fire door in the party wall. The door held the fire sufficiently so that firemen could extinguish it with one hose stream. This door had been installed two weeks prior to the fire.

Supermarkets

Jan. 3, London, Ont. Loblaw Groceterias Ltd. $300,000

Supermarket. "Built to burn" was how one fire official described this 14,000 sq. ft. building. The brick walls and the plumbing were about the only parts that wouldn't burn, the roof being wood, the ceiling combustible fibreboard and the attic comprising a maze of wood hangers and supports. No automatic protection or watchman service was provided; consequently, fire that broke out sometime after 6 P.M. Saturday night (closing time) was not discovered until seen by a passerby at noon Sunday. By then the fire was beyond control in the undivided attic and soon broke through the roof. Blank walls limited access for fire fighters.

London Free Press

This type of supermarket with no automatic fire protection, combustible fibreboard ceiling, a maze of wood hangers and supports in an undivided attic and blank exterior walls gives this occupancy a bad fire record. This fire in London, Ontario on January 3 went undetected until noticed by a passerby.

McLaughlin and Company

When detected at 1:54 A.M. by a passing motorist, fire was beyond control in this 25,000 sq. ft. shopping center near Phoenix, Arizona. No automatic protection and an undivided roof space over the supermarket and eight other stores caused the total loss.

Jan. 15, near Phoenix, Ariz. Irion Shopping Center $407,500†

Supermarket and eight other stores. The 25,400 sq. ft., 1-story masonry, wood-and steel-joisted building was severely damaged by fire that had made great headway before discovery by a motorist at 1:54 A.M. No watchman or automatic protection was provided and the masonry or wooden partitions between stores extended only to the base of roof trusses. These fire protection weaknesses allowed the fire to develop to serious proportions in one of the stores (origin could not be determined because of extent of damage), to burn through the combustible ceiling and spread via the undivided roof space to other stores before discovery. Lack of water severely handicapped fire fighters protecting exposures.

Jan. 23, Detroit, Mich. Holbrook Market $269,000

Supermarket. Fire that destroyed the unsprinklered 20,000 sq. ft., 1-story building originated in a pile of empty cartons that had been thrown out the back door by employees. The fire broke out when sparks from fire in a near-by rubbish receptacle in the yard fell in the pile of cartons. On entering the stock room by burning through a wooden door in the rear wall, flames burned through the combustible fibreboard ceiling and entered the undivided concealed space between the roof and ceiling. The undivided roof space was well involved when the fire was discovered by a policeman at 12:30 A.M.

Feb. 11, Peterborough, Ont. Loblaw Groceterias Ltd. $386,500

Supermarket, auto supply store, appliances shops. Three adjoining stores were destroyed by fire that originated in the basement of an undivided 13,500 sq. ft. 1-story brick, steel-framed building housing a supermarket. The fire was discovered by a passerby at 6:31 P.M. The basement was not sprinklered, a protection deficiency that in combination with windowless walls and lack of basement entrances in exterior walls through which hose stream could be directed, prevented fire control. The first floor collapsed and fire completely involved the supermarket. Spread to stores on either side was apparently through cracks made in party walls when steel roof supports buckled.

Service areas are the place of origin in 3 out of 4 supermarket fires, according to a recent NFPA study (see NFPA FR54-2). This Tucson, Arizona fire, reported below, is an example.

June 6, Tucson, Ariz. Safeway Stores, Inc. $300,000

Supermarket. Failure to separate the service and sales areas of the 17,500 sq. ft. building with a fire wall resulted in destruction of the contents and roof of the unsprinklered 1-story brick, steel-joisted store. Embers from an incinerator being loaded by an employee ignited a pile of trash in the service area. During the few minutes while the employees and then a customer attacked the blaze with portable extinguishers, the fire extended to the combustible fibreboard ceiling and spread rapidly to the sales area. The employees and a few customers escaped safely before flames enveloped the interior.

Sept. 10, Wheatridge, Colo. Safeway Stores, Inc. $350,000

Supermarket. Faulty construction of an incinerator chimney allowed sparks to lodge in the attic of an unsprinklered 22,500 sq. ft. brick, wood-joisted building. Fire is believed to have smoldered in the attic several days before smoke was noticed by the occupant of an adjacent building, a few minutes after the supermarket had been locked up for the night. Firemen were able to enter the first floor but on discovering that the attic space overhead was filled with fire, they took their lines outside. When flames broke through the roof, hose streams could be put to good use but by then the undivided building was beyond saving.

Sept. 23, Greeneville, Tenn. Twilight Supermarket, et al. $265,000

Supermarket, furniture storage, building materials storage, tin shop, apartments. Overheated wiring resulting from the use of oversized fuses was the reported cause of fire that destroyed the 40,000 sq. ft. 1- and 2-story building of mixed construction. The fire originated in the area in the rear of the first floor used for storage of building materials and despite the presence of several people, was not discovered until 4:30 P.M. when part of the store ceiling fell, exposing the fire to grocery clerks. Everyone got out safely but by then the fire had made so much headway that it was beyond the capacities of the limited equipment of the fire department. Because of the headway gained by the fire before help could arrive from other communities, efforts were directed toward saving adjacent dwellings.

Oct. 9, Denver, Colo. Safeway Stores, Inc. $500,000

Supermarket. At 11:00 P.M. a passerby discovered fire that originated in the attic of the undivided 12,500 sq. ft. 1-story brick, wood-joisted building and telephoned the alarm. On arrival firemen found the sprinkler alarm ringing (the basement was sprinklered), the building charged with smoke, and debris in the first story that had fallen from the attic when parts of the combustible fibreboard on plywood ceiling had collapsed. Heat and smoke and danger of being hit by debris kept

firemen outside the building where use of hose streams was severely handicapped by the windowless walls on all sides of the building. When the fire was finally brought under control five hours later, exterior walls were all that remained of the superstructure. Sprinklers operated at all openings to the basement, keeping fire from this area.

Following the fire a careful investigation led to the conclusion that a defective incinerator chimney was the cause. In the presence of fire department and store officials the incinerator chimney was dismantled. It was discovered that two sections of flue liner between the roof and first floor ceiling had not been installed, a defect that probably allowed heat to escape and ignite wood roof members.

An investigation of other supermarkets in the Denver area revealed ashes in attic areas suggesting that faulty construction of incinerator chimneys has been responsible for some of the recent supermarket fires. See fire Sept. 10 at Wheatridge, Colorado (page 271).

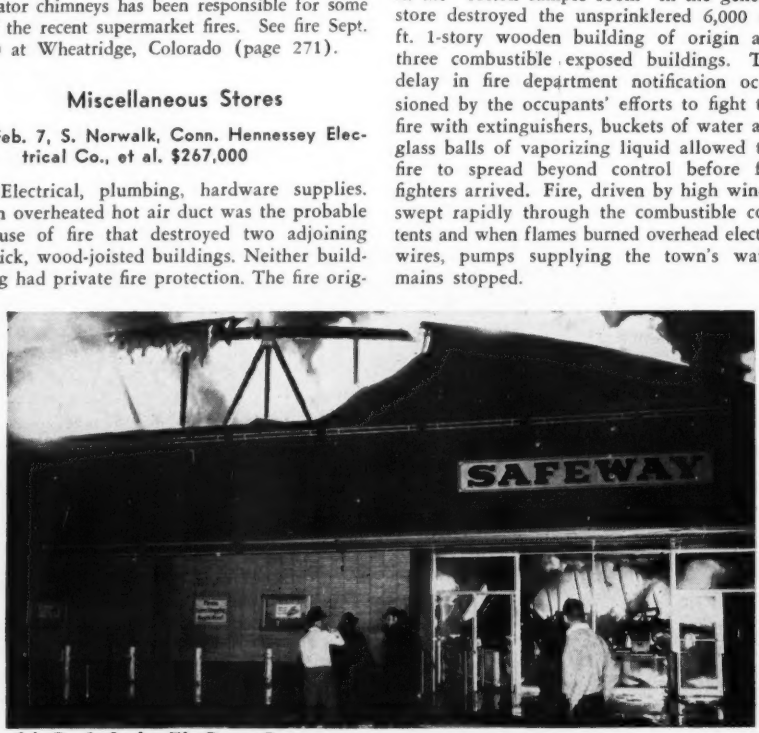
Miscellaneous Stores

***Feb. 7, S. Norwalk, Conn. Hennessey Electrical Co., et al. $267,000**

Electrical, plumbing, hardware supplies. An overheated hot air duct was the probable cause of fire that destroyed two adjoining brick, wood-joisted buildings. Neither building had private fire protection. The fire originated in the rear of an electrical appliance store on the first floor of a 2-story building and had made considerable headway when noticed by a passerby at 9:49 A.M. (Sunday). Fire spread along the wooden suspended ceiling and the combustible fibreboard wall of the electrical appliance store and into an adjoining 3-story building through a 10-inch square hole in the brick wall separating the two buildings. This hole had apparently been made to accommodate heating pipes at some time in the past and concealed by combustible fibreboard wall finish.

Sept. 16, Mt. Olive, Miss. Calhoun General Store, et al. $350,000

General store, furniture store, farm implements store. Fire started by a customer who accidentally dropped a lighted match in the "cotton sample room" in the general store destroyed the unsprinklered 6,000 sq. ft. 1-story wooden building of origin and three combustible exposed buildings. The delay in fire department notification occasioned by the occupants' efforts to fight the fire with extinguishers, buckets of water and glass balls of vaporizing liquid allowed the fire to spread beyond control before fire fighters arrived. Fire, driven by high winds, swept rapidly through the combustible contents and when flames burned overhead electric wires, pumps supplying the town's water mains stopped.



Col. D. C. Snyder, The Denver Post

Another Safeway supermarket burned with a large loss at Wheatridge, Colo. when sparks from an incinerator ignited the combustible attic space in the unsprinklered 22,500 sq. ft. building.

$2,962,000 Loss in 9 School Fires

With schooling facilities already extended almost to the bursting point, a community today cannot afford to lose one square foot of precious classroom space. Yet, a conservative estimate indicates that there were at least 4,000 fires in school buildings in 1954. Many of them destroyed or so severely damaged the buildings that they were no longer usable, thereby depriving children of classroom space and placing an additional burden on the taxpayers.

In nine communities, school fires of "large loss" magnitude occurred last year. The total loss from these fires was $2,962,000. Included in this destruction were 109 classrooms, two cafeterias, two gymnasiums and several auditoriums. Schooling facilities for 3,000 pupils were destroyed in just these nine fires.

Schools of combustible construction are generally recognized as warranting automatic fire protection. Justification for this is amply evidenced in this record, as six of the schools were conventional brick, wood-joist construction and three wood frame. In seven out of the nine cases, the school was not occupied at the time fire was detected and in only one of the seven instances was watchman service (of a sort) provided. Thus, the record speaks for itself: if schools are to be left unoccupied during many hours of the day, especially if they are of combustible construction, one way to keep down your tax rate is to provide automatic protection.

Four of the schools were 1-story buildings and five multi-storied structures. In three cases origin was directly traced to the basement. Insufficient fire partitions, undivided attics and air conditioning ducts lacking dampers were among the reasons for the widespread damage.

In these nine "large loss" fires, no lives were lost. However, in a Cheektowaga, N. Y. school fire on March 31, 1954, where the property damage was less than $250,000, fifteen sixth grade children lost their lives when a 1-story frame school annex burned. Nineteen other children were burned or injured escaping from the building. A full report of this tragedy was published in the April 1954 QUARTERLY.

Feb. 2, Dryden, N. Y. Village of Dryden $250,000.

Classrooms for first grade and seventh through twelfth grades. Firemen summoned by an outsider at 4:00 A.M. found fire beyond control in the top story and attic of the unsprinklered 3-story brick, wood-joisted building constructed in 1910. Originating in a third story storeroom, fire entered the attic space and because masonry walls in the building did not extend above the third story ceiling, spread laterally above the entire third story of the 185 ft. by 60 ft. building. Firemen managed to save most of the addition to the building that was built in 1938 and did commendable work in saving all records and in salvaging office equipment. Because of complete destruction in the area of origin, no cause for the early morning blaze could be determined.

Mar. 16, Exeter, Pa. John Casey School $275,000.

Grade school. A neighbor going to work at 5:30 A.M. was the first to discover fire that destroyed the 2-story brick, wood-joisted building. The building was completely involved when the first fire company arrived. Three other volunteer departments responded after mutual aid calls. No watchman or

automatic protection was provided to detect a fire before it could reach such proportions.

April 1, Littleton, N. H. Union School District $383,000

14-classroom building for grades 7 through 12. Originating beneath the stage in the auditorium, fire entered air-conditioning duct openings and spread through the ducts to the attic. With no automatic protection or watchman service provided, the fire had made great headway before discovery by a neighbor at 11:57 P.M. When firemen arrived, fire had involved so much of the interior of the 2-story brick, wood-joisted building that they could not get in.

May 6, McKim Township, Ont. MacLeod Rd. Public School $307,500

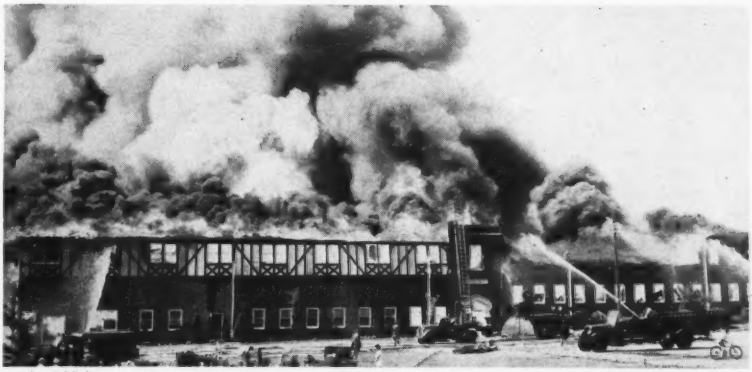
16-room classroom building. With eight classes already staggered because of insufficient teaching facilities, the public school board was faced with a major problem when fire destroyed all but four classrooms in the unsprinklered 2-story brick, steel-framed building and a 6-room addition being rushed to completion. For an hour before the fire was finally discovered and reported by a passerby at 10:15 P.M., neighbors had smelled smoke. The fire originated and was confined to the new addition when firemen arrived, but because there were no hydrants, the fire entered the main building while hose lines were being laid from a creek 2,000 ft. away. Four classrooms were saved by a firewall backed up by hose streams. Welding operations were the cause.

***June 2, Ocosta, Wash. Ocosta School District No. 123 $320,000**

Auditorium building, classroom building, gymnasium, two play sheds. While school was in session one of the pupils noticed fire burning on the outside of the 8,475 sq. ft. 1-story wooden building housing the auditorium. Hot ashes dropped outdoors or sparks from an unscreened incinerator were the most probable causes. Firemen from Aberdeen, 36 miles away, responded but by the time they

Sudbury Star Photo

Big schools serving rural communities always present special problems. The lack of automatic protection permitted this fire in McKim Township, Ont. to reach large proportions before detection, and the absence of underground fire mains restricted the operations of the Sudbury Fire Department which responded.



Daily Oklahoman

When converted to its present use as a Student Union Building of the Oklahoma City University, this former barracks had been dressed up with a simulated brick exterior and had been otherwise made aesthetically presentable but no automatic fire protection had been installed to assure prompt detection and control of fire. When fire broke out on June 16, therefore, it made considerable headway before discovery.

arrived, wind-driven flames had enveloped the auditorium building and had jumped a 48-ft.-wide clear space to the 9,425 sq. ft. 1-story classroom building. From there flames spread to the gymnasium three feet away and to the two adjacent play sheds. After emptying the water tank on their pumper the Aberdeen firemen were helpless. The Coast Guard responded from Westport, 8 miles away, and used water from a small mud hole to save the bus garage and a dwelling. Eight volunteer firemen came from Westport but were unable to bring their apparatus because of fire district regulations.

***June 16, Oklahoma City, Okla., Oklahoma City University $400,000**

Student Union Building (cafeteria, basketball court, lounge), laundry. An overheated refrigeration system motor in the basement of the Student Union Building caught fire and flames destroyed the 22,000 sq. ft. 2-story wooden building and an adjacent 12,000 sq. ft. 1-story laundry. Both buildings were former barracks. When converted to their present uses, brick veneer exterior wall coverings had been added but no installations of automatic fire protection had been made in the combustible structures to assure prompt detection and control of fire. Consequently, fire made considerable headway in the unsprinklered basement before discovery by an employee at 2:41 P.M. Flames rapidly enveloped the combustible interior. A laundry building four feet away was destroyed when fire entered through plain glass windows. In the face of punishing heat, which felled twenty of their number, fire fighters managed to save a large wooden barracks-type building next in line for destruction. All plain glass windows on the exposed side were broken by the heat. Flying brands carried by the wind ignited the roofs of several dwellings in the vicinity. Damage to these roofs was minor with the exception of one 1-story residence six blocks north of the fire where some $3,000 damage was caused.

Nov. 25, Aldine, Tex. Aldine Independent School District $301,500

Public school. When flames were seen issuing from this one story school building at 1:15 A.M., it was too late to start thinking about the serious omission of fire protection in this unincorporated community. Lacking automatic protection in the building, hydrant water supplies, and a local fire department organization, the school was totally destroyed. Houston and one or two volunteer fire departments responded to the calls for help, but they could do little without water supplies. Cause of the outbreak could not be determined because of the total damage and delayed discovery, but the fire appears to have started near the chemistry laboratory. An undivided concealed space between the ceiling and roof permitted rapid spread of flames to all parts of the building. Insurance was only about $184,000.

Dec. 21, DeLand, Fla. Stetson University $275,000

College dining room. During the Christmas holidays fire destroyed the 13,500 sq. ft. 1-story brick, wood-joisted commons building, the only campus eating place. The fire originated in the centrally located kitchen and spread through unprotected doorways to each of the three dining area wings adjoining the kitchen. Delayed discovery (watchman tours every two hours), lack of sprinklers and lack of division walls with protected openings were responsible for the total loss.

Dec. 22, Stamford, Conn. Burdick Junior High School $450,000

Public school. Full details are not yet available on this fire which caused a total loss to the Burdick Junior High School which for 58 years had served Stamford. Occurring two days before the Christmas vacation, the fire was detected by an outsider who telephoned th fire department at 12:49 A.M. Upon arrival firemen realized that the flames had a majo headstart and a second alarm was sounded a 12:57. It appears that the fire originated in th graphic arts department in the basement o the first floor and travelled up through ventila tion ducts to the attic and then through th roof of the 3-story brick, wood-joisted struc ture. No automatic protection equipment wa installed and apparently no watchman serv ice was available. Fire fighters used 17 hos streams and poured about a million gallons o water on the burning building in 10° temperatures. The School Superintendent es timates it will cost $2,500,000 to replace th school which served 700 children. Since th budget called for $853,000 capital outlay fo the next fiscal year and insurance coverag on the burned building amounted to only abou $450,000, an increase in the tax rate wa forecast in local newspapers.

Five Large Garage Fires

Five of the approximately 20,000 garage fires in the United States during 1954 caused $1,313,500 loss, or 5 per cent of the total U. S. estimated garage fire loss. The lessons from these five fires should be taken to heart by each garage operator if he wants to be sure that his particular garage is not a candidate for a "large loss" fire in 1955 or some future year.

The special garage fire hazards associated with flammable liquid storage and handling influenced fire spread in each of the five fires, and in one instance (Blackwell, Okla.) a flammable liquid was responsible for the start of the fire. In the other cases flammable liquids, although not immediately involved, later helped spread flames through the buildings as flames reached paint stocks, rubber cement, undercoating materials and gasoline in vehicle fuel tanks.

As important as the special flammable liquid hazard was in these five garage fires, of even greater importance was the lack of private fire protection. None of the five buildings was protected by sprinklers or an automatic fire detection system. Four of the five fires broke out when no one was present and in the absence of automatic protection spread beyond control before discovery. In the fifth fire the advantage gained by prompt detection by an employee was lost because there were no sprinklers to control flames that spread rapidly over combustible interior finish.

These five garage fires confirm the fire protection lessons brought out in NFPA Occupancy Fire Record FR54-3, namely the need for safe handling and storage of flammable liquids, automatic fire equipment, subdivision of large areas and protection of stairways and other openings.

M. S. Nutter

This 3-story garage at Woodsville, N. H. was in flames when firemen arrived. Several other buildings were destroyed before the wind-driven flames were checked. Below zero temperature handicapped firemen.

***Jan. 13, Woodsville, N. H. H. O. Taylor, et al. $265,000**

Repair garage, furniture store, mortuary, two dwellings, barn, paint sheds. Delayed discovery, strong winds and below zero temperatures counteracted years of blackboard drills and fire station discussion on the best method to confine a fire that might originate in any one of a group of congested combustible buildings. The 3-story Taylor garage (formerly a livery stable) was in flames from top to bottom when firemen answered a passerby's alarm at 12:40 A.M.

Flames spread to involve one adjoining and three adjacent wooden buildings and, a short time after firemen arrived, jumped an 18-ft. alley to enter a 3-story brick, wood-joisted building. Shutters closed by firemen prevented flames from entering this building through windows in upper stories, but fire entered through unprotected windows on the first story. Fire jumped a street to ignite a wooden dwelling but further spread to many other exposed wooden buildings was prevented by the effective operation of mutual aid companies that responded according to a prearranged plan.

Howard O. Weber

Rubber dust, rubber cement, solvents and undercoating material helped spread fire through this garage at Springfield, Ohio (see story page 278).

Jan. 19, Springfield, Ohio Ripley, Inc. $253,500

Auto sales and service, tire recapping. Fire originating in the tire recapping section at one end of the large, undivided and unsprinklered brick, wood-joisted building, destroyed two-thirds of the structure because sprinklers and fire walls were missing. A parapeted wall in the structure was in no sense a fire barrier because of unprotected doorways and openings between the ceiling and roof. Fire spread through these openings and would have spread beyond a second wall through doorways protected by ordinary wooden doors had not firemen been posted at these openings with hose streams. Rubber dust, rubber cement, solvents and undercoating material increased the intensity and rate of spread of fire through the building. A passerby gave the alarm at 9:35 P.M. although 5 persons were in the building.

March 9, near Jacksonville, N. C. Onslow Motor Co. $260,000

Repair garage. The undivided attic of the 10,500 sq. ft. 1-story concrete block, wood-joisted building was well involved before the fire was discovered by a garage employee at 12:30 P.M. Feeding on paint, lacquer and thinner stored in the building, as well as gasoline released from ruptured vehicle fuel tanks, the fire soon had control of the entire building. Firemen from Jacksonville were hampered by lack of fire hydrants.

***April 3, Blackwell, Okla. Oklahoma Tire & Supply Co., et al. $275,000**

Garage, furniture store, bank, stores offices. Two adjoining unsprinklered 2 story brick, wood-joisted buildings were destroyed by fire that originated in a repair garage occupying part of the first floor of one of the buildings. The fire broke out while the fuel line on an automobile was being "blown out" and was probably caused by ignition of gasoline vapors either by an electric spark or a gas-fired heater. Flames spread over combustible interior finish, up open stairways and within concealed wall spaces to all parts of the building. Warping of an unprotected second-floor steel beam anchored in a party wall pulled down part of the wall and allowed fire to spread to the exposure housing stores and offices. Bank records and currency in a vault were not damaged but other occupants lost all records kept in ordinary file cabinets. 15,000,000 gallons of water were applied by firemen from 14 cities and two industrial plants.

Aug. 6, Holdrege, Nebr. Linder Motor Co. $260,000

Sales and service. Fourteen new Chryslers and Plymouths, approximately 20 used cars and 900 new tires were among the contents destroyed when fire leveled this unsprinklered and undivided 11,100 sq. ft. 1-story brick, wood-joisted garage. The fire was discovered by a passerby at 8:00 P.M.

Journal-Tribune

This $275,000 fire at Blackwell, Oklahoma occurred when gasoline being "blown out" of an automobile fuel line was ignited.

10 Lumber Yard Fires Cost $4,000,000

Of increasing concern in many communities are the fire-spread characteristics of lumber yard fires. In this year's "large loss" lumber yard fire picture, eight out of the ten fires reported spread to exposed properties. Mutual aid or "outside" fire department assistance was required in six of the ten cases. In the New York City, Cleveland and Baltimore fires, large numbers of hose streams and deluge guns were required. In the Baltimore case, 52 fire companies were placed in service to control the fire and prevent greater fire spread, even though two masonry fire walls were present to protect exposures.

Nine out of the ten lumber yards were not operating at the time fire was first discovered and yet in only one case was detection made by an on-duty watchman. In one instance fire that originated in a lumber storage shed was not detected until it entered a locker room protected by a central-station-supervised automatic fire detection system. In another occurrence an alert telephone operator got a trouble signal on a line and asked the police to investigate. When the police arrived at the scene a two-story building (unoccupied at 6:20 A.M.) was in flames. In the one case where a watchman first observed the fire, he delayed calling the nearest (out-of-town) fire department while trying to extinguish the fire with a bucket of water.

The responsibility that lumber yard operators hold to the communities they serve demands constant vigilance against just such losses as are reported here. The NFPA Standard on Retail Lumber Yards (NFPA No. 47) gives invaluable guidance on fire safety measures.

***Feb. 13, New York (Queens), N. Y. Queensborough Lumber Co. $250,000**

Lumber yard buildings. Summoned by an outsider's alarm at 10:12 P.M., firemen found that fire had fully involved a large lumber storage building, had spread to four smaller 1-story buildings in the yards, had ignited lumber piles nearest the buildings and had burned wiring on railroad communication poles adjacent to the yard. A shower of sparks was endangering neighboring buildings. The fire was confined to the lumber yard by firemen using 19 hand lines and three deck pipes.

March 3, Pocatello, Idaho, Pocatello Lumber Co. $346,000

Lumber yard, builders' supplies warehouse. The 2-story wood-frame, metalclad warehouse of 35,000 sq. ft. ground floor area and the adjacent lumber yard were destroyed by fire that was not discovered until a trouble signal over the telephone at 6:20 A.M. indicated to the telephone operator that all was not well. Her opinion was confirmed when the police officer who had been dispatched to investigate reported that the 2-story building was in flames. Firemen were successful in confining the fire to the building and lumber yard although adjacent buildings were scorched and sparks showered the city. The obvious lesson from this fire was the need for automatic protection and watchman service.

***Mar. 14, Cove City, N. C. Wells-Oates Lumber Co. $430,000**

Lumber yard, office, dry sorting shed, lumber shed. At 3:00 A.M. the watchman discovered fire in grass between piles of lumber in the yard and ran for a bucket of water. By the time he returned, however, flames had spread to the lumber and were beyond control of such first aid fire appliances due to high winds prevalent at the time. Had a fire department been readily available the fire could undoubtedly have been kept to a relatively small area, but Cove City had no fire department. When firemen arrived with a pumper with high

Lumber yard fires are difficult to extinguish and control because of the inferior construction, severe radiant heat conditions and the flying brand hazard. Here fire fighters are manning a 2½-inch hose line, one of nine placed in operation, at the Pocatello Lumber Co. fire on March 3.

pressure water fog equipment from New Bern, 18 miles away, 1,600 sq. ft. of stacked lumber was involved and flames were being carried to other stacks by 30 mph winds.

When a second piece of apparatus arrived, a 14,000 sq. ft. area of lumber was burning. Water pumped from a canal was used to save exposed dwellings, several of which caught fire. Lumber yard buildings adjacent to the yard storage were destroyed. A 200-ft. clear space saved the mill buildings.

***April 2, Cleveland, Ohio The Dougherty Lumber Co., et al. $450,000**

Two lumber sheds, yard-stored lumber, glazing building, five dwellings. Delayed discovery, combustible buildings, congested and high lumber piles were among the factors responsible for destruction of most of the 74,000 sq. ft. lumber yard and minor damage to buildings adjoining the yard. The fire is believed to have been set by several men seen in the yard prior to its outbreak. Origin was apparently in the center shed, and since there was no watchman provided and only the locker room section was protected by a central-station-supervised automatic fire detection system, the fire was not discovered until about 15 minutes later when it entered the locker rooms an operated the detection system at 2:11 A.M.

When fire fighters arrived they found 20-ft high piles of lumber in the yard on fire an flames extending 100 ft. into the air. shower of sparks was endangering buildings i the neighborhood. By 2:45 A.M. seven ad ditional alarms had been struck. With ampl water from 25-inch mains, the large fire figh ing force responding to the multiple alarm was able to confine and bring the fire unde control by 6:00 A.M. An 18-ft.-high bric wall at one side of the yard protected th lower parts of the five exposed dwellings. Th upper parts were scorched but did not ignit Several sprinklers that operated in a woode glazing building adjoining the yard were c valuable assistance to firemen in their succes ful efforts to save that building.

***May 31, near Pueblo, Colo. Farmers Lum ber and Supply Co., et al. $266,000**

Fire destroyed most of this congeste 80,000 sq. ft. lumber yard including an ol fice building, a small lumber mill, four larg storage sheds, yard-stored lumber, and a adjacent 8,000 sq. ft. broom corn ware house. The mill was heavily involved whe

the fire was discovered by a passerby at 8:00 P.M. All buildings were unsprinklered.

This fire gave further evidence of the fallacy of relying on substandard watchman protection for prompt fire detection. The watchman, who lived in the second story of the office building, was not required to make regular tours of the sprawling lumber yard. Some delay in response of volunteer firemen resulted since the original call went to the Pueblo Fire Department, which is prohibited by law from responding outside the city limits. Fire spread from the mill to a communicating 17,600 sq. ft. lumber warehouse soon after the first volunteer company arrived at 8:15 P.M. and commenced fighting the fire in the building of origin. Ten minutes later, a second volunteer company attempted to connect to a hydrant 800 feet away but found it defective and could not shut the hydrant valve once it was opened. They had to leave the hydrant flowing (open 2½-inch butt) and moved to a closer hydrant. By the time two additional pumpers arrived, the lumber yard and its buildings were beyond saving, and efforts were made to protect the adjacent broom corn warehouse. The interior of the latter building was ignited when heat from the lumber yard fire penetrated the metal roof, which sloped toward the lumber yard. Parapeted 12-inch-thick fire walls prevented spread from the broom corn warehouse to the adjoining broom factory and another warehouse.

***July 14, Cliffwood, N. J. Keyport Lumber Co., et al. $400,000**

Lumber yard, hotel, dwelling. At 3:30 P.M. a lumber yard employee noticed a grass fire in the rear of the lumber yard property. The fire department was called at once but strong winds carried the fire into the congested sheds and yard-stored lumber before hose streams could be placed in operation. Twenty fire departments sent men and equipment to help the Cliffwood firemen, but inadequate water supplies severely limited their effectiveness. Besides destroying the lumber yard and sheds, fire damaged an adjacent hotel and a dwelling.

***July 30, Wilkes-Barre, Pa. Goff Lumber and Millwork Co. $310,000.**

800 ft. by 200 ft. lumber yard including sheds, yard-stored lumber, woodworking building, office. Failure to provide at least 15-foot-wide spaces between buildings and

Paul Buley

In Wilkes-Barre, Pa. on July 30 fire fighters were called to the 800 ft. by 200 ft. lumber yard operated by the Goff Lumber Company. Principal damage was to the mill and woodworking sheds. Firemen did a superior job to prevent flame spread to the exposures from the congested yard.

lumber piles and failure to provide 15-foot-wide driveways so that the maximum dimensions of lumber piles would not exceed 50 ft. by 150 ft. allowed fire to destroy everything in the congested yard. (NFPA Standard No. 47 outlines good practice recommendations for retail lumber yards.) Origin was in a shed used for storage of laths. Since no watchman or automatic protection was provided, fire department response was delayed until the fire was seen by a neighbor at 9:08 P.M.

***Nov. 11, Dover, N. J. Park Union Lumber Co. $500,000**

Lumber yard, building supply warehouses, offices, dwelling. Requests for detailed data on this fire have not been answered but the local newspaper (*Dover Advance*) carried a rather complete description of "one of the worst fires in Dover's history." Detection of the blaze in this lumber yard was delayed until flames were noted by a passerby at 1:25 P.M. on Armistice Day. He turned in a box alarm. First fire companies to arrive found the fire so advanced they immediately radioed for mutual aid from surrounding towns as well as all other city fire companies. In all, some 200 firemen fought the blaze and 12 fire departments gave their services. Lumber yard officials reported that $250,000 worth of lumber was destroyed along with stocks of other building materials, coal supplies and 5 trucks. One exposed dwelling was destroyed, a multi-story glass company building sustained a $30,000 loss and several other buildings were ignited but firemen secured prompt extinguishment. Lumber yard records were saved by a safe.

***Nov. 16, Baltimore, Md. Furst Brothers Co., Inc., et al. $750,000**

14 buildings: lumber warehouse, freight terminal, dry cleaning plant, blacksmith shop, 10 dwellings. The need for exposure protection was clearly demonstrated by this fire. Although confined to an unsprinklered 5,000 sq. ft. 1-story building when discovered, eventually flames destroyed or severely damaged eight buildings and less severely damaged six others. Forty pumpers, 10 trucks and seven other pieces of apparatus responded to the 11-alarm fire. The fire, originating in a lumber shed across the stree from a fire station, was believed set. Whe discovered by a fireman at 9:04 P.M., it ha reached such intensity that fire fighters wer driven from a rear alley where they hope to make a stand and prevent spread to ex posures. When the building collapsed int the alley a few minutes later, fire entere two 1-story brick, wood-joisted building through plain glass windows. Flames als rapidly involved other congested and ser ously exposed buildings before the fire coul be surrounded and checked by the large fir fighting force that was quickly assemble Two blank masonry fire walls were of grea value to fire fighters during their efforts t control the fire.

***Dec. 30, Boyertown, Pa. L. H. Schmoye Lumber Co., et al. $250,000**

Four lumber and building supplies war houses in lumber yard, seven dwellings, lodg hall, six miscellaneous buildings. A fire wit conflagration potentialities because of com bustible construction, congestion of building weak water supplies and shifting winds wa checked by good fire fighting after destroyin four storage buildings (21,000 sq. ft. tot ground floor area) and five dwellings. Nin other buildings were damaged.

Lightning is believed to have started th fire in an unprotected 2-story building sup plies warehouse. Discovery was by an oc cupant of a near-by dwelling at 3:30 A.M When the first volunteer fire company arrive three congested wooden warehouses were in volved. Flames soon spread to a fourth a shifting winds prevented firemen from holdin their positions. Several hoses burned befor they could be withdrawn.

Fortunately, there was a strong and promp response by several volunteer fire department from surrounding towns and it was not to long before 1,450 gpm, the maximum amoun of water that could be obtained from th town's water system, was being put to goo use. Radiant heat had ignited fourteen brid and wooden buildings on the periphery of th lumber yard, but despite the limited wate supplies, firemen managed to save all excep five from being completely destroyed.

6 Church Fires Cause $2,677,000 Loss

Serious church fires follow a pattern from which we may easily establish prevention recommendations. A study of the church fire problem was published by the Association in a pamphlet entitled "Churches are Burning,"* based on a study of 300 church fires. Many of the lessons discussed in the pamphlet are illustrated in these 6 large church fires.

Note, for instance, that all 6 of these large fires were first reported by outsiders. Lack of automatic protection and watchman service was 100 per cent. Four out of the six fires occurred between 10:00 P.M. and 7:00 A.M., only two during the day and both these fires occurred when no one was in either building. Fire detection was thus left to chance. This could be so easily corrected by the installation of an approved system of automatic detection or sprinkler equipment.

Structural conditions have long influenced fire spread in church buildings. Undivided roof spaces inaccessible to firemen (note the September 2 fire in Youngstown, Ohio), nonfirestopped concealed wall spaces (a feature of the January 24 fire in Huntsville, Texas), and the use of combustible interior finish (true in the November 13 fire in Waco) are examples of how history repeats.

An unusually high percentage of church fires (as opposed to most other occupancy classes) are caused by lightning. In the most recent NFPA study (11th Edition, *NFPA Handbook of Fire Protection*), 9.7 per cent of all known church fire causes are attributed to lightning. This year's worst church fire was

(Continued on page 286)

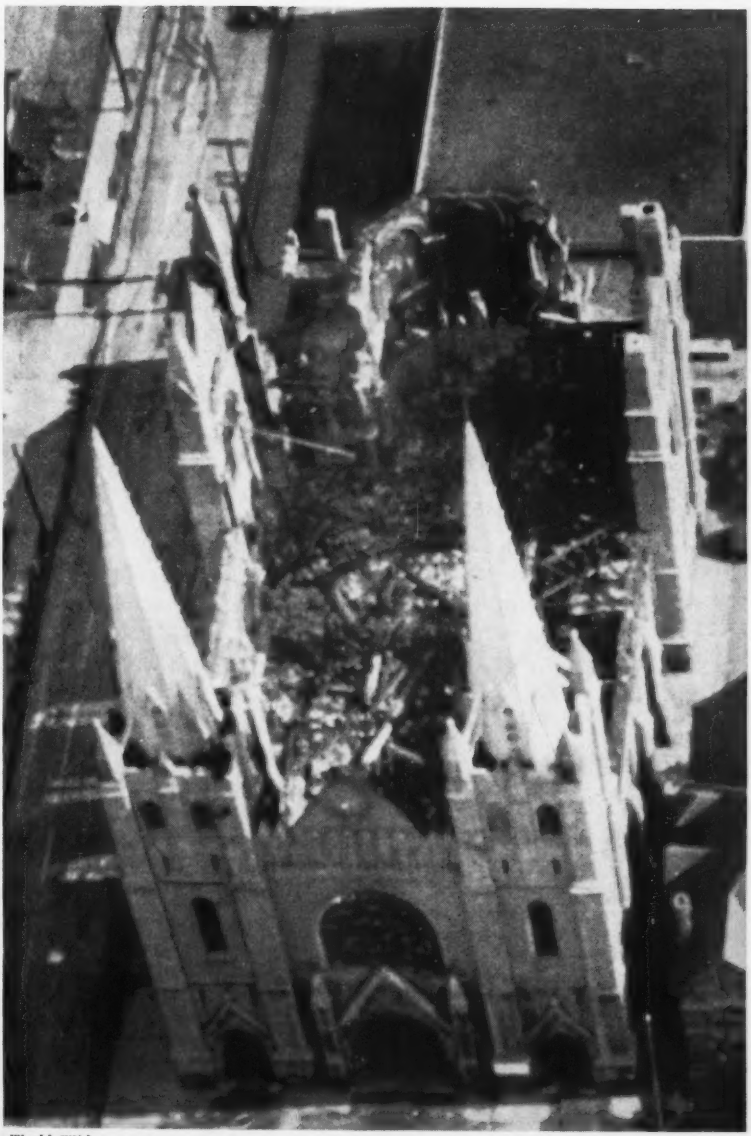
*Copies available from NFPA for $1.00 each

C. C. Springfield

It was on a Sunday, within an hour after services, that this Baptist Church in Huntsville, Texas was destroyed by fire. The height of the church building was a handicap to local fire fighters, who lacked aerial ladder equipment and had only two 500 gpm pumpers. Mutual aid was secured from five neighboring towns.

Vindicator Staff Photograph

Fire pictures are often spectacular and this night scene of the St. Columba's Cathedral fire in Youngstown, Ohio is no exception. Believed caused by a stroke of lightning, fire was detected by a passerby at 10:56 P.M. and firemen estimate that the choir gallery and undivided loft space under the roof may have been burning for an hour before this chance discovery.



World Wide

The Youngstown Cathedral fire of Sept. 2nd, on the following day presented this sobering picture. Replacement of the 175 ft. by 80 ft. granite and limestone edifice will probably cost in the neighborhood of $1,250,000 according to local newspaper reports. The installation of a standard lightning protection system would have saved this loss according to reports received by the NFPA.

from this cause and is especially interesting because the fire was the result of a strictly substandard lightning protection system. An experience of this type should be a warning to all those interested.

Jan. 11, Omaha, Nebr. First Methodist Church $444,000

What may happen when a church is left during the night with no automatic fire protection or watchman protection was demonstrated by the destruction of this 14,800 sq. ft. 2-story building. The janitor locked up the building and went home at 5:00 P.M. About 10:00 P.M. a tenant of an adjacent apartment building smelled smoke but did not call the fire department. At 11:32 P.M. a passerby noticed what he thought was a small fire in a shed back of the church and so notified the fire department. On arrival, the engine company that was dispatched found the fire, but instead of being in the shed, it was spreading through the upper part of the large church. Origin was in the not-cut-off boiler room in the church basement but the oil-fired boiler was not th apparent cause and arson is suspected.

Jan. 24, Huntsville, Tex. First Baptist Churc $300,000; 1 killed

At 12:40 P.M. (Sunday) neighbors notice smoke coming from a fourth story Sunda school room and called the fire department According to the fire department, the fire wa probably caused by a fault in wiring supply ing a wall heating unit and had likel been burning within the nonfirestopped wal two hours before discovery. Another repor suggests that careless smoking in the buildin by teen-agers was the cause. The fire coul not be checked by the volunteer fire depart ment and burned down through the unsprin klered 4-story brick, wood-joisted building A man carrying valuables from the buildin was killed when struck by a falling wall.

Aug. 31, Toronto, Ont. United Church $250,000

With no watchman or automatic protection provided, fire that originated in the

C. P. Photo

At 6:51 A.M. on Tuesday morning, Aug. 31, firemen were called to the United Church in Toronto and were greeted by this scene. Evidence indicates that the fire started in the main auditorium. Lack of automatic protection doomed the structure.

Waco Times Herald

The destruction of the sanctuary of the Austin Avenue Methodist Church in Waco, Texas which was ravaged by fire on Nov. 13. Delayed detection gave fire a great advantage.

auditorium was beyond control before being noticed by a passerby at 6:51 A.M. The auditorium and roof of the stone, plank and timber building were destroyed as well as a large organ. The building had undergone extensive renovation during the past three years.

Sept. 2, Youngstown, Ohio St. Columba's Cathedral $986,000

Fire that broke out in roof rafters after a spire had been struck by lightning destroyed the huge 1-story stone, wood-joisted church. Since the building was equipped with a lightning rod system, an investigation was made to determine why this had not provided the desired protection. Several substandard features were discovered: conductors were too small; conductor fasteners were improperly installed, corroded and in some instances pulled loose from the building; aerial terminals in some cases did not extend above the object they were supposed to protect; no interconnections were made between the conductors and steel framework, pipes, bell frames and other metalwork. The fire was discovered by a passerby, about an hour after the lightning struck. An undivided loft extended the entire length of the building under the wood truss roof supports and the fire secured its firm grip on the building in this concealed space.

Oct. 11, Kedgwick, N. B. Notre Dame des Prodiges Roman Catholic Church $297,000

At 4:20 P.M. a neighbor saw smoke coming from the basement of this 14,760 sq. ft. stone, wood-joisted church. When the volunteer fire department arrived, smoke was so dense that the basement could not be entered or the fire located. Streams directed through basement windows did not reach the flames which eventually burned up through the 62-ft.-high building. A wiring fault at a pump motor was the reported cause.

Nov. 13, Waco, Texas Austin Avenue Methodist Church $400,000

Firemen responding to a passerby's alarm at 3:37 A.M. found the large auditorium of this 18,000 sq. ft. church filled with smoke that was so dense that the seat of the fire could not be located. A few minutes later, fire broke through the roof and then enveloped the auditorium. The roof collapsed a short time later. Although there were unprotected doorways in the masonry wall between the auditorium and classroom section of the building, firemen stationed at these openings prevented spread to the classroom section. The fire originated in a storage room behind the platform. No watchman or automatic protection was provided.

Hotels and Other Large Residential Fires

In the eleven large loss fires to occur in occupancies used primarily for residential purposes, nine persons lost their lives, 18 were injured and the estimated total loss was $4,659,500. Thus, the 1954 large loss fire experience was similar to the record of 1953 when there were also eleven large loss fires, resulting in seven deaths and $4,463,000 damage.

All nine of the deaths occurred in one hotel fire in Anaconda, Montana on October 30.

As in 1953, hotels suffered the most large loss residential fires. There were four in 1954, six in 1953. Three apartment fires,† two prisons, one hospital and one mansion completed the 1954 list.

In eight of the fires the cause was not determined. Three fires were set.

Remembering that all of these fires involved buildings in which people lived, it was disturbing to note that many of those features of construction and private protection normally considered essential for life safety in combustible residential buildings were largely missing. In only one fire was sprinkler protection present;

†See also pages 252, 253, 256, 259-262, 267, and 271 for apartments over stores.

Wide World

Awakened in the early morning hours by the shouts of the building superintendent, all occupants of the Loch Arbour, N. J. apartment in the right background escaped safely before it was enveloped in fire.

none had automatic detection; in six cases no watchman was provided and in two the service was substandard. Sprinkler protection was a factor in the prison fire at Jefferson City, Mo. In three of the six sprinklered buildings involved in this incendiary fire, sprinklers put out the fire. In the other three sprinklered buildings, the sprinklers held the fires in check until water supplies were depleted.

Construction weaknesses were responsible for the fact that in all but one multistoried building, fire spread to more than one story. All buildings were combustible and therefore not only the contents but also the buildings themselves contributed fuel to the fire. In six of the eight fires in multistoried buildings, flames spread vertically through open stairways, open elevator shafts or both. In three cases fire spread within nonfirestopped walls.

Apartment Buildings**

***May 21, Loch Arbour, N. J. Loch Arbour Apartments, et al. $550,000**

Apartment building, drive-in restaurant, bathing pavilion. Awakened by smoke in the early morning hours, the superintendent and a tenant of the apartment building ran through the corridors awakening other tenants. All escaped before fire spread up through the unsprinklered 4-story wood-framed stuccoclad building. A 20-mph wind carried sparks to several surrounding buildings. All except a drive-in restaurant and a bathing pavilion were saved by four fire companies from Asbury Park and one each from 12 other neighboring communities.

June 5, Oneonta, N. Y. Butt's Building $250,000

Apartments with furniture store and offices. Police cruising past the 4-story building at 2:35 A.M. saw flames issuing from windows of a fourth story apartment and radioed the alarm. They then raced through the building arousing the occupants in time for them to go down the single stairway or get to the roof of an adjoining building. The fire could not be brought under control and burned down through the building. Fire walls prevented spread to exposures.

***Aug. 9, Butte, Mont. Butte Hotel Building, et al. $800,000**

Three buildings housing 42 apartments, 8 stores, lodging house. At 4:00 A.M., the watchman in the apartment building smelled smoke and called the manager. The two of them set out on a search for the fire which they did not find, but fortunately an occupant of a fourth story apartment on smelling the smoke ran to the lobby and aroused all occupants by sounding the building's fire alarm system. The more than 100 occupants fled to safety as smoke filled the building.

Responding to a phoned alarm at 5:10 A.M., firemen found no visible flames but it was apparent that fire had spread within nonfirestopped wall and ceiling spaces throughout the 10,300 sq. ft. unsprinklered 4-story brick, wood-joisted building. When flames finally broke out into the open, they appeared to envelop the entire building at once. Fire spread to an adjoining 4-story brick, wood-joisted building by way of plain glass windows that opened into a lightwell common to both buildings. The 2-story wooden building adjacent to the building of origin was also destroyed when fire entered through unprotected openings in the exposed wall. Shutters on a 6-story building across a narrow alley from the building of origin were given a major share of the credit for saving that building. Many of the shutters closed automatically and others were closed manually before the links fused.

Dwelling

Dec. 7, Lattingtown, N. Y. Louis J. Horowitz $304,500

30-room mansion. Failure of the occupants of this mansion to provide automatic protection or standard watchman service for their home while they were spending the winter in Florida, allowed fire to spread beyond control in the 2-story brick, wood-joisted building before discovery. At 4:00 P.M. and at 6:00 P.M. the caretaker had checked the building and found everything in order. At 10:30 P.M. a neighbor passing

**See also pages 252 to 271 for other fires involving apartments over stores.

Combustible fibreboard interior finish, nonfirestopped walls and lack of subdivisions were structural shortcomings contributing to rapid flame spread in this 19,600 sq. ft. 1-story stuccoclad, wood-frame hospital building in North Little Rock, Ark. on June 4.

the building smelled smoke but did not investigate. At 11:30 P.M., when the fire was finally discovered and reported by a policeman, it had control of the first floor of one wing. By 12:30 A.M. flames had spread through many unprotected openings to all parts of the building, destroying valuable furnishings including oil paintings, antiques and tapestries.

Hospital Building

June 4, North Little Rock, Ark. U. S. Government, Veterans Admin. $415,000

Hospital rehabilitation building, housing various shops for printing, weaving, metal and woodworking. Substandard watchman protection and lack of automatic protection were important factors in the destruction of this 19,600 sq. ft. 1-story stuccoclad wood-framed building. Structural features reported as contributing to fire spread included combustible fibreboard interior finish, nonfirestopped walls, lack of subdivisions for the first story and attic. The fire was discovered by an outsider at 9:30 P.M. more than an hour after the building had been checked by a watchman on one of his 4-hourly patrols. The delayed discovery had allowed the fire to take advantage of the various structural weaknesses and spread beyond control before hose streams could be placed in operation.

Hotels

Oct. 8, Wichita Falls, Texas, Milam Hotel, et al. $500,000

Hotel, department store, shoe store, barber shop, music shop. At 5:50 P.M. the clerk of the hotel which occupied the upper two floors of the unsprinklered 3-story brick, wood-joisted building, saw smoke coming from the stairway to the ground floor. Smoke rapidly filled the building spreading through open stairways and corridors and was so dense when firemen arrived that they were unable to enter the building. The 27 hotel guests escaped down a rear outside fire escape. Flames broke through the roof shortly after firemen arrived and sections of walls collapsed an hour after the fire was reported. Origin was apparently in one of the four stores occupying the first floor.

Oct. 23, Memphis, Tenn. Rex Hotel, et al. $250,000

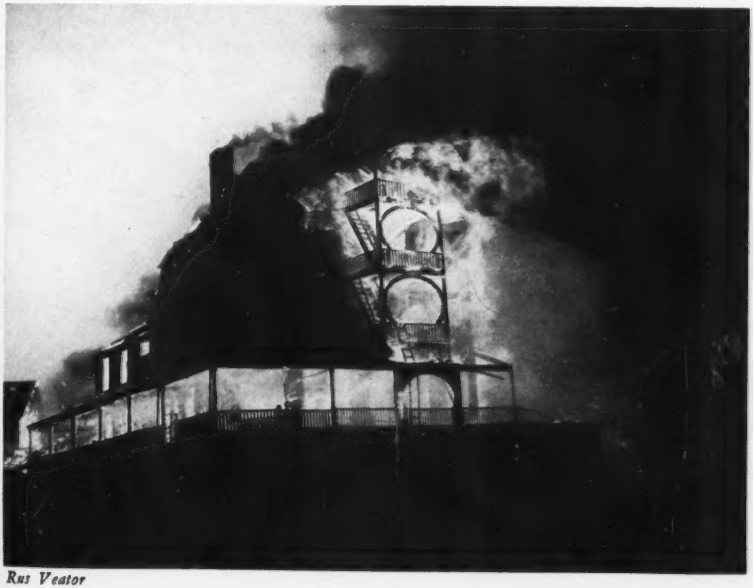
40-room hotel, three stores. At 1:19 A.M., the hotel clerk on one of his half-hourly tours of the hotel corridors (the hotel occupied the second and third stories of the 3-story brick, wood-joisted building) noticed smoke coming from the basement stairway. Guests, notified by a room buzzer system, escaped in their night clothes.

On arrival, firemen found much of the basement involved in fire, and, as is usual with fires in unsprinklered basements, were delayed in getting water on the fire because of the smoky conditions and limited access. In many cases this delay allows the fire to enter nonfirestopped wall spaces and travel up through the building. In this instance, however, the walls apparently were adequately firestopped at the basement ceiling level since firemen, making good use of four new spray type cellar nozzles that were directed through floor vents and holes chopped in the floor, extinguished the fire before it got out of the basement.

During the fire, gas escaping from a pipe in the basement exploded, in some instances violently. Repeated efforts by gas company employees and firemen to get into the basement to shut off the gas valve were thwarted by heat and explosions. A valve was finally located outside the rear of the building.

Oct. 30, Anaconda, Mont. Flood Hotel, et al. $400,000; 9 killed

Hotel, hardware store. Nine hotel occupants were trapped and killed in their second and third story rooms when fire of suspicious origin destroyed the unsprinklered 7,000 sq. ft. 3-story brick, wood-joisted building. At about 5:00 P.M. firemen were summoned to extinguish a fire that had apparently been set beneath the basement stairs. An hour later, when firemen were recalled to the building, the third story was in flames and many of the occupants who survived had to be rescued over ladders. Open stairways were impassable.



Rus Veator

This Gloucester, Mass. summer hotel was destroyed while closed for the winter. The fire was discovered by the hotel owner, who slept in the building.

***Nov. 27, Gloucester, Mass. Hawthorne Inn, et al. $350,000**

Summer hotel, dwelling. While closed for the winter, the large undivided and unsprinklered hotel was destroyed by fire that originated sometime during the night in the lobby. It was not discovered until shortly after six in the morning when the owner, the only one in the building, was awakened by smoke. Fire spread up the open stairways and elevator shafts and to the upper floors of the 37,500 sq. ft. 3- and 4-story wooden building. An adjacent dwelling was damaged. Poor water supplies hampered fire fighting.

Penitentiaries

Aug. 15, Kingston, Ont. Kingston Penitentiary $340,000

Prison trade shops, stables, tailoring, paint, carpentry shops. Using their cigarette lighters, 50 rioting convicts, later followed by more than 400 others, set more than 12 fires in various prison buildings. Kingston firemen were kept outside the prison walls until picked prison guards, aided by 160 soldiers, put down the rioting. On Aug. 13 a fire in the attic of the main cell block did $112,000 damage to the undivided attic space which extended over all four wings.

Sept. 22, Jefferson City, Mo. Missouri State Penitentiary $500,000

8 buildings destroyed, 3 damaged (industrial buildings, school, chapel). At 6:00 P.M. rioting prisoners, using paint thinner stored in an isolated building, set fires almost simultaneously in 11 prison buildings. Fire departments responded, but because of continued rioting, firemen were not allowed to enter the prison until 7:00 A.M. the following day, by which time all fires had either burned out or been extinguished by sprinklers. Six of the 11 involved buildings were protected by 1-source sprinkler systems supplied by a 500,000-gal. gravity tank that also supplied all other prison water needs. The amount of water in the tank when the fire occurred was not known although difficulty had been experienced in keeping the tank full because of low water in wells. One of the three pumps supplying the tank failed early in the fire when overhead electric wires burned.

In three of the six sprinklered buildings sprinklers put out the fires but prolonged discharge caused water damage. In the other three, fires were held in check until 11:00 P.M., when the water supply was depleted. Fires then destroyed these three buildings. The five unsprinklered buildings were also destroyed.

News Tribune Co.

Eleven buildings, six of them sprinklered, were set afire at the Missouri State Penitentiary, Jefferson City. For details see report below.

Four of Six Hangar Fires Over Million

A total of slightly more than four acres of wood hangar construction were destroyed in the six "large loss" hangar fires of 1954. Four of the six occurred in Canada. The smallest hangar was three times the maximum size of an unsprinklered wood frame hangar recommended by the NFPA Standard on Aircraft Hangars (NFPA No. 409) and the largest was 9½ times this advisory area limit. As a result of the large areas, not only were six buildings destroyed but also 90 aircraft.

Typical of hangar fire experience, almost 94 per cent of the losses incurred were on the contents ($5,175,000 of the $5,532,500 total damage). Four out of the six hangar fires occurred while the buildings were in full or partial operation, and yet each of these fires spread to involve the entire structure. This also repeats a factor evident from previous studies. See NFPA "Aircraft Hangar Fire Experience" (NFPA FR 52-2). This analysis of 269 hangar fires shows that 67 per cent of the fires break out during operating periods emphasizing the rather unusual fact that despite prompt detection, control of hangar fires cannot be secured as effectively as in most other occupancies where the internal hazards are not so severe.

Fueled aircraft, as many as 37 in the hangar in Calgary, spread these fires so quickly as to prevent control in the unsprinklered combustible structures.

Jan. 5, near Great Bend, Kansas. Great Bend Municipal Airport $350,000

Aircraft hangar, 24 fueled aircraft. Hourly watchman service is not enough for the protection of large aircraft hangars. This hangar was inspected and found in safe condition at 10:43 P.M. At 11:50 P.M. the building collapsed due to this large fire which was first detected by the guard at 11:28 P.M. Lacking automatic protection of any type, the hangar was destroyed as were 24 fueled aircraft stored inside.

The photo above shows the Great Bend fire at about its maximum intensity on the night of Jan. 5, 1954.

Great Bend fire fighters responded by radio alarm from their central fire station six miles away. At the time of arrival, the building was a mass of flames and about all that firemen could do was to concentrate on protecting surrounding buildings. The destroyed hangar was entirely of wood construction, 240 ft. long and 180 ft. wide, and was built in 1942 for temporary use during the war. Since the end of the war, it had been used principally as a hangar for personal aircraft.

It was impossible to determine the cause of the fire due to the complete destruction but investigators believed from the report of the night watchman that it originated in one of the aircraft and theorized that it could have been caused by an aircraft electrical system fault. NFPA records show that this is the primary cause of aircraft storage fires; mechanics would be well advised to de-energize aircraft electrical systems by disconnecting battery terminals before bringing them into the hangar for storage.

April 10, Penhold, Alta. Royal Canadian Air Force $1,330,000

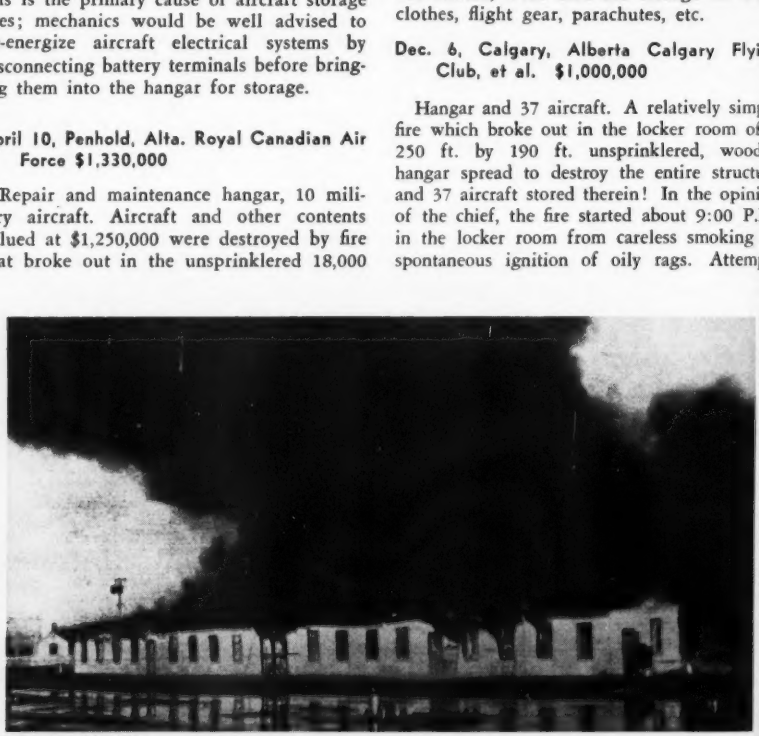
Repair and maintenance hangar, 10 military aircraft. Aircraft and other contents valued at $1,250,000 were destroyed by fire that broke out in the unsprinklered 18,000 sq. ft. wooden hangar at 5:25 P.M. Valuab tools, maintenance equipment, and recor were lost as well as the 10 aircraft. Ori nating in an aircraft due to mishandling a flammable liquid (further details not leased), the fire immediately involved th aircraft and spread very rapidly through t hangar.

April 29, Sea Island, B. C. Royal Canadi Air Force $1,500,000

Hangar and six military aircraft. A 1(ft.-long unsprinklered wooden hangar w destroyed by fire that was discovered at 9: P.M. by personnel in the vicinity. The f originated in wooden lockers in the rear the hangar, spread to adjacent aircraft a quickly enveloped the interior of the lar combustible structure. The lockers, where t fire started, were used for storage of wo clothes, flight gear, parachutes, etc.

Dec. 6, Calgary, Alberta Calgary Flyi Club, et al. $1,000,000

Hangar and 37 aircraft. A relatively simp fire which broke out in the locker room of 250 ft. by 190 ft. unsprinklered, wood hangar spread to destroy the entire structu and 37 aircraft stored therein! In the opini of the chief, the fire started about 9:00 P. in the locker room from careless smoking spontaneous ignition of oily rags. Attem



Wide World Photo

The first of two "large loss" Royal Canadian Air Force airport fires in one month destroyed this maintenance hangar at Penhold, Alberta on April 10. Ten military aircraft were destroyed in the 161 ft. by 112 ft. building.

Associated Press

Thirty-seven planes were destroyed in fewer minutes in this Calgary, Alberta hangar fire which occurred on December 6. A locker room door left open allowed flames originating therein to involve a plane wing in the dope room and then spread throughout the crowded wood, unsprinklered building.

by occupants to extinguish the fire with two carbon dioxide hand extinguishers were unsuccessful. In retreating to give the alarm they left the door open between the locker room and the main aircraft storage and maintenance area. Flames spread to the fabric-covered wing of one plane located near the door opening and from this point raced through the crowded aircraft storage area in a matter of seconds. Fire fighters from the RCAF Fire Station, located just a few feet away, totalled 5 and assistance was requested from Calgary. Eventually four engine companies were working on the fire. Water supply from five hydrants on a dead-end six-inch fire main was insufficient and suction was taken from a reserve 100,000-gallon tank. This was empty by midnight. Two other hangars, the fire station, a bulk fuel storage building and several other structures were damaged by radiated heat but fire fighters with a deluge gun and nine 2½-inch hose lines saved the exposed buildings.

The manager of the Flying Club which lost 17 planes said, "It took 25 years to build up the club and it only took that fire 25 minutes to break it down." Insurance coverage was far from total.

Dec. 8, St. Johns, Que. Aircraft Industries of Canada, Ltd. $1,027,500

Aircraft reconditioning. At 2:30 A.M. fire was discovered in the unsprinklered 37,400 sq. ft. wooden hangar. When firemen arrived about five minutes later the entire interior was in flames and fuel tanks of the 12 aircraft in the building were exploding. Firemen were successful in keeping flames from five adjacent hangars. A detailed report of this fire is being withheld pending completion of investigation of cause.

Dec. 23, Sandston, Va. Virginia Air National Guard $325,000

Hangar, one military aircraft. As is usually the case, contents losses far exceeded the building loss when this unsprinklered 15,000 sq. ft. hangar of wood construction burned to the ground. The ratio of contents to building loss in this case was 5½ to 1. The fire was detected by an occupant in the building at 4:40 A.M. The airport, Henrico County and City of Richmond Fire Departments responded to a telephone alarm but the fire in the large area building which had a combustible fibreboard finish was too far advanced to be saved. The cause is still under investigation. A B-26 was destroyed as well as aircraft maintenance equipment owned by the Virginia Air National Guard.

United Press

The pilot and eight civilians died after a Sabrejet crashed in a residential district of Long Beach on Jan. 12. Four homes and three autos were badly damaged by the fire from sprayed jet fuel. Municipal and rural fire department handling of aircraft fires is covered in an advisory text offered by the NFPA and designated NFPA No. 406 (35 cents per copy).

Geo. E. Cron Photo

Two employees of a boat manufacturing plant in Grand Prairie, Tex. were killed when an F-80 crashed into the plant on February 2 and burst into flame. The pilot was thrown clear by pulling the ejection lever.

The Large Aircraft Fire Accidents of 1954

The year began and ended with tragic aircraft accidents. In January 1954, the sixth Comet jet transport accident in 15 months carried 35 to their deaths between the islands of Elba and Montecristo half an hour after leaving Rome. On Christmas day, 28 persons perished in a crash fire of a Stratocruiser transport at Prestwick, Scotland.

The most tragic loss of life occurred in Moose Jaw, Saskatchewan on April 8 when an in-flight collision between a R.C.A.F. Harvard Trainer and a Trans Canada Airlines "North Star" caused 37 deaths. The airliner fell in flames and burned a dwelling to the ground. The most pathetic accident occurred at Kallang Airport in Singapore on March 13, 1954 when 33 persons died needlessly in a Constellation crash fire for lack of adequate fire services. This accident was made the subject of a NFPA Special Aircraft Accident Bulletin, available from the Association for 50 cents.

About two-thirds of the "large loss" aircraft fires occurring in the United States and Canada and reported here involved U. S. Air Force aircraft (numbering 36 incidents in all). There were five major airline aircraft fire accidents in the U. S. and Canada during the year. The balance of the 54 involved U. S. Navy aircraft (six), aircraft manufacturers (six) and air national guard (one). The total dollar loss from these accidents is estimated at $68,715,000 and 240 lives were lost.

There were 11 major airline aircraft accidents which involved fire in other parts of the world, according to our incomplete reports. These 11 accidents cost 264 lives and represented aircraft values of about $12,000,000. Included are two cases of in-flight structural failures (the two "Comet" accidents in January and April off the Italian coast). There were many other accidents in the U. S. and throughout the world when fire followed impact but because of the nature of the accidents, the occurrence of a fire was considered incidental.

In the U. S. and Canadian experience, 30 of the fires reported occurred as a result of crash impacts, 21 originated as in-flight fires and 3 as ground fires. The in-flight fire problem in jet aircraft seems to be particularly serious and in several cases in-flight explosions occurred. The reciprocating engine fire problem has not been completely solved either as evidenced by the eight major accidents reported in this study. Automatic detection equipment for aircraft powerplants and engine fire extinguishing systems have only a fair record of accomplishment but research continues.

The crash fire prevention activity of the National Advisory Committee for Aeronautics has been reported to NFPA members in the QUARTERLY (see the October 1953 issue, pages 121-138). New developments in the past year include completion of some tests on crash resistant fuel cells by the Civil Aeronautics Administration and the announcement by a prominent manufacturer of an NACA inspired "crash fire prevention system." These design factors must be relied upon to help solve the aircraft fire problem as mobile fire fighting equipment limitations become more and more evident.

Jan. 8, near Wichita Air Force Base, Kans. U. S. Air Force, B-47, $3,000,000, 2 killed

Two of the three crew members were killed when a B-47 "Stratojet" made an unsuccessful landing at the Wichita Air Force Base.

Jan. 12, Long Beach, Calif. U. S. Air Force, F-86, $700,000, 9 killed

The pilot and eight civilians died after an F-86 Sabrejet on a routine training flight crashed into the residential Signal Hill area of Long Beach. Apparently coming in for a landing through an overcast at the Long Beach Municipal Airport, the aircraft without warning of any trouble, plummeted into a street, exploding and spraying four homes and three automobiles with flaming jet fuel. Several other dwellings were damaged by fire and a home for the aged narrowly missed being involved. One of the dead evidently had a heart attack after witnessing the accident but the others were fatally injured as a result of the crash and fire.

Jan. 26, Fort Dix, N. J. U. S. Air Force, F-86, $700,000, 1 killed

An F-86 Sabrejet caught fire on take-off from the McGuire Air Force Base and crashed in flames three miles away. The pilot apparently attempted to parachute but the aircraft was too close to the ground and the pilot was killed.

Feb. 2, Grand Prairie, Tex. Texas Air National Guard, F-80, $260,000, 2 killed

Two employees of the Lone Star Boat Manufacturing Company were killed when an F-80 Shooting Star crashed into the plant and burst into flame. The pilot pulled his ejection lever and was thrown out of the fire area (about 60 feet) and survived with only slight injuries. The fire caused $10,000 damage to the plant.

Feb. 9, near Trois Pistoles, Que. U. S. Air Force, H-21, $250,000, 3 killed

The Air Force grounded its fleet of about 30 Piasecki helicopters after this accident

Associated Press

A refueling accident at Hunter Air Force Base on February 22 destroyed this B-47 and killed one airman. No data has been released on the cause of the fire.

Associated Press

Rupture of wing fuel cells and fuel piping by the collapse of the landing gear resulted in this fire which destroyed a B-36 at Fairchild Air Force Base as it was warming up preparatory to take-off.

which killed two Air Force officers and a Piasecki field representative. The aircraft was en route to Goose Bay, Labrador when the helicopter exploded in flight. The debris was widely distributed in fields near this town. This was the third crash involving this model, the other two occurring in 1953.

Feb. 22, Hunter Air Force Base, Ga. U. S. Air Force B-47, $3,000,000, 1 killed

A refueling fire on the ground caused this loss which killed one airman and injured two others. NFPA requests for technical data on the accident directed to the Base Commanding Officer and Headquarters, U. S. Air Force have not been answered. Newspaper accounts indicate an explosion in the wing tanks ripped the aircraft open and spilled large quantities of jet fuel on the flight line hardstand. (See NFPA No. 407-T for fire saftey recommendations on fueling aircraft on the ground.)

Feb. 26, Huntingdon, Tenn. U. S. Air Force, C-119, $250,000, 4 killed

A "tradition" of this 3,500 population town which allowed any hometown pilot to "buzz" the courthouse came to a tragic end when a C-119 flown by a resident USAF pilot struck the town flagpole, exploded in flight and crashed, killing all four occupants of the plane. Burning gasoline and wreckage were scattered over a four-block area. Two men plowing a garden were burned when their clothing ignited and a pair of mules ran wild and were so badly burned they had to be shot. The main portion of the fuselage landed in an open field and the bodies of the four victims were recovered from the burned out wreckage.

Feb. 27, Fairchild Air Force Base, Wash. U. S. Air Force, B-36, $5,000,000

A B-36 was under full power and ready to release brakes prior to take-off when the left main landing gear failed. The collapse of the gear caused the left wing to contact the runway and the wing broke by the No. 1 reciprocating engine. The wing cells were ruptured and a 2-inch fuel pipe to the No. 1 engine was also split open. The propellers striking the ground stopped Nos. 1, 2 and 3 reciprocating engines and fire was observed by the crew of twenty aboard the aircraft. Evacuation was started immediately and despite the fact that escape was through the fuel spill and fire area, all occupants miraculously escaped. The crash

Wide World Photo

A Banshee Navy jet attempts to clear the end of the USS Oriskany's flight deck but note that arresting gear is low. See the two photos, page 301, for what happened.

fire crews were on the scene within two minutes and six major crash trucks, two tank trucks and three pumpers saw service during the next three hours of fire suppression efforts. Some 1,200 gallons of liquid foam, 2,800 pounds of foam powder and 6,000 pounds of carbon dioxide were used.

Fire fighters who reached the scene first (at 12:52 A.M.) had no way of knowing if all the crew was safe and therefore first entered through the nose section to check for possible survivors. Just about this time, ammunition started to explode. This forced temporary abandonment of fire fighting but after the 20 mm ammunition and four bombs had detonated, fire fighters resumed their efforts. Damage to the aircraft by this time was so extensive, water fog instead of foam and carbon dioxide was used.

Another difficulty experienced in this fire fighting operation was that while Nos. 1 and 2 jet engines failed when the left wing contacted the runway, jets 3 and 4 continued in operation as the fuel valves were not closed by the crew prior to their evacuation. Both of these two engines exploded while firemen were attempting to make the rescue check.

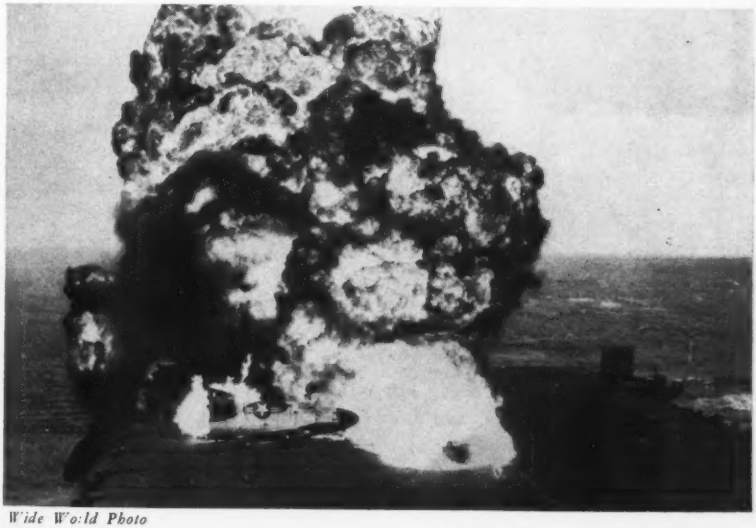
Magnesium alloy parts continued to bur although covered with a deep foam blanke It was not until almost three hours late that the fire was completely extinguished.

Mar. 2, aboard U.S.S. Oriskany at Sea, U.S Navy, F2H-3, $250,000

The crash and ensuing fire occurred durin a landing approach. The aircraft struck th after edge of the flight deck breaking th aircraft into four large sections and severa small ones. The fuel tanks ruptured and th 215 gallons of fuel (aviation gasoline) aboard spilled and were ignited immediately The forward section of the fuselage, on engine and the left wing skidded up the flight deck of the carrier and other portions fell to the deck below or overboard. Burning fuel spread over the flight deck but fortu nately the forward section of the fuselage, which contained the cockpit, came to rest at the edge of the fire area. Rescue and fire fighting operations commenced almost simul taneously with the initial impact, it being a standard procedure aboard carriers to man the fire and rescue equipment during all air operations. This ready alert played a most important part in the rescue of the

Wide World Photo

The jet broke up in four parts at the impact resulting in this intense fire on the USS Oriskany that appears unsurvivable.



Wide World Photo

The pilot escaped from the F2H-3 with the aid of Navy damage control fire fighters aboard the USS Oriskany.

pilot and the fire suppression. Two men in protective clothing reached the pilot and assisted in getting him free of the cockpit and fire area. Six hoses (2½-inch) from the nearest high capacity fog foam stations were placed in service. Approximately 350 gallons of foam were used to extinguish the fire along with 375 pounds of carbon dioxide. The fire was extinguished in less than four minutes.

Mar. 5, Davis-Monthan A.F.B., Ariz. U. S. Air Force, B-47, $3,000,000, 4 killed

A Stratojet bomber crashed and burned shortly after take-off from the Davis-Monthan Air Force Base near Tucson, Arizona. All four crew members aboard were killed. It appeared that the B-47 hit a power pole and crashed just two miles south of the Air Base.

Mar. 17, near Nellis Air Force Base, Nev. North American Aviation, TF-86, $500,000, 1 killed

One of the nation's top test pilots, Joseph A. Lynch, Jr. of North American Aviation, was killed when a new Sabrejet trainer he was flying went out of control during a low-altitude roll and exploded after a wing tip hit the ground. The pilot was thrown from the aircraft and killed instantly. The aircraft was the only one of its kind built up to the time of the accident and brought to a quick end what was to have been a nationwide demonstration at USAF bases of this new transonic trainer.

Mar. 19, near Annapolis, Md. U.S. Air Force, C-119 $250,000, 18 killed

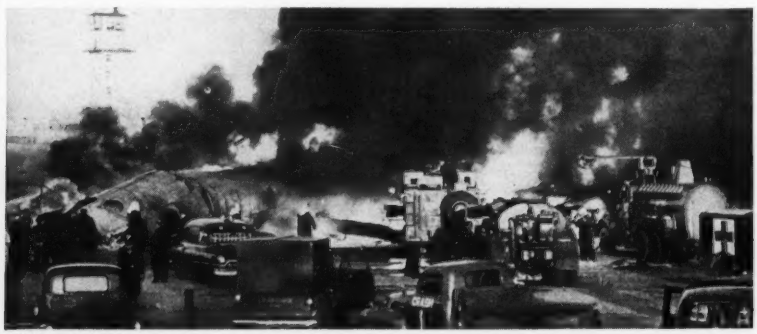
Twelve passengers and a crew of six perished when a C-119 crashed in flames in a forest near Annapolis. Volunteer firemen arriving at the scene found 15 bodies within a 10-acre area over which the wreckage was scattered. Intense flames prevented reaching the main portion of the fuselage where the other three occupants were trapped. Fire which spread to surrounding timber and brush was quickly brought under control.

Mar. 25, near Orleans, Mass. U. S. Air Force, F-94C $700,000, 2 killed

The aircraft "dived like a flaming comet into Cape Cod Bay," according to eye witnesses which included personnel in the fire tower in Brewster. The Lockheed F-94C "Starfire" was based at Otis Air Force Base and was on a routine training flight when the in-flight fire occurred which caused the aircraft to go out of control at an estimated 5,000 feet. It hit the water about a mile off shore carrying its two crew members to their death.

Mar. 29, 1954 Fairchild A.F.B., Wash. U. S. Air Force, B-36, $5,400,000, 7 killed

While the exact cause of this accident has not been released (and may not be known), the sequence of events is established. The B-36 was to make an aborted take-off run at about the 3,000-foot marker on the run-



Wide World Photo

Seven were killed in this crash fire at Fairchild Air Force Base on March 29. The 115 fire fighters arriving quickly on the scene were unable to control the fire involving 16,000 gallons of gasoline.

way. Instead of this, the aircraft veered off the runway when it had traveled less than 1,000 feet, crossed over the grass area and two taxiways and ended up in an inverted position on the Air Base gasoline pumping station. En route, it first struck aircraft ground equipment stands, then leveled a frame construction building (losing two jet engines and one reciprocating engine and spraying ignited fuel throughout this building), and when it struck the concrete pumping station it leveled the building, broke gasoline pumps and piping, cartwheeled and came to rest on its back.

Just how three crew members of the ten aboard escaped unaided after this rough ride cannot be easily explained except that Lady Luck was riding with them. All three were injured. Fire fighters and rescue personnel, totaling 115, were quickly on the scene (within a minute). They removed 4 of the crew from the tail section and one by the right wing within 12 minutes. Two showed signs of life but were dead on arrival at the hospital. The other two bodies were recovered later but it was evident from their injuries that they had been killed by the impact forces. To reach the four crew members in the tail section, forcible entry had to be accomplished through blisters (the aircraft being inverted).

It is estimated that at least 16,000 gallons of gasoline burned in this fire. Fire control was attempted using 5 large USAF crash trucks, two tankers, 4 pumpers, cranes and tractors. Carbon dioxide was used initially to cover the rescue path and flood the tail section to assist in the rescue operations in that area. Foam was simultaneously applied to secure this fire and to insulate the fuselage. Some 650 gallons of liquid foam and 2,500 pounds of powder foam were consumed. Water fog and straight streams were used to cut down radiated heat, for exposure protection and to extinguish building fires caused by the aircraft collisions. Magnesium parts which ignited burned under four inches of foam seriously hampering final extinguishment.

Mar. 30, Fort Bragg, N. C., U. S. Air Force, C-119, $350,000, 9 killed

With its left engine in flames just after take-off from Pope Air Force Base for Louisville, the pilot attempted to return to the Base but finding he could not make it, he attempted to land on a parade ground at Fort Bragg. The parade field was 400 yards long and 150 yards wide and presented an attractive target for the emergency. With the loss of power, however, the aircraft struck the roof of a bachelor officer's quarters (where the tail section broke off), glided part way across the parade ground and skidded 100 feet into the mess hall. A severe fire broke out in the wreckage of the aircraft and the frame building. A total of nine men were killed and ten injured. Among those killed were the pilot and four in the C-119. The others were apparently in the building when the aircraft struck. If the accident had occurred two hours later, 200 men might have been eating lunch in the mess hall.

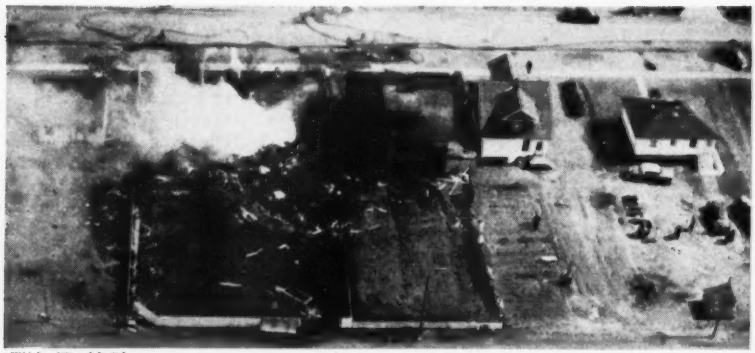
Soldiers at the accident site pulled three men from the aircraft immediately after the accident but it was nearly two hours later before further rescue work could be done because of fire conditions.

Apr. 8, Moose Jaw, Sask. Trans Canada Airlines and Royal Canadian Air Force, North Star and Harvard Trainer, $600,000, 37 killed

"I can't miss him" were the last words received from the pilot of a Trans Canada Airlines plane. This radio message came seconds before the worst aircraft accident involving fire in North America during 1954.

It was caused by an in-flight collision between a TCA "North Star" (similar to a DC-4) and a "Harvard" RCAF trainer at an altitude of about 3,000 feet. The impact resulted in an in-flight fire aboard the transport which within seconds was followed by an explosion. The pilot apparently tried to make an emergency landing on a golf course but crashed into a dwelling on the edge of the open space. All aboard the plane (26 passengers, five TCA officials and four crew members) plus the only occupant of the dwelling and the pilot of the trainer were killed.

Flaming plane parts and debris were scattered over a wide area, parts striking a school housing 400 children. Only the dwelling hit was severely damaged and it was burned to the ground. The in-flight explosion and the damage caused by the collision scattered parts rather widely and one engine was found eight blocks from the main wreckage site. Local firemen were aided by police in clearing crowds of spectators who gathered at the crash scene.



Wide World Photo

Following an in-flight collision between a commercial airliner and a military training plane, fire broke out in the airliner, after which it crashed and set fire to this Moose Jaw, Sask. dwelling.

Apr. 22, near Goldsboro, N. C. U. S. Air Force, C-119 $250,000, 2 killed

Parachutes saved two of a crew of four aboard a "Flying Boxcar" which exploded in flight while on a training flight near Goldsboro. The aircraft was flying with two other planes when it suddenly went out of control. The in-flight explosion tore the ship apart but two crew members were somehow able to parachute safely. The fuselage, burning fiercely, crashed on a rural road.

May 5, near Brownsville, Tex. (in Mexico) U. S. Navy, PBM, $250,000, 10 killed

Scant details are available on this accident which killed ten according to newspaper reports. The Navy announced a PBM flying boat with ten aboard was missing on a flight from the Corpus Christi Naval Air Station during the night. The next day a search plane sighted the still burning aircraft 90 miles southwest of Brownsville in Mexico.

June 1, near Madison, Wisc. U. S. Air Force, F-89C, $1,000,000, 1 killed

The pilot of an F-89C Scorpion was killed when his plane crashed and exploded in a field 200 yards from a state highway near Madison. The aircraft was based at Truax Field in Madison. No explanation is given for the accident.

June 10, near Larchmont, N. Y. U. S. A Force, F-84, $300,000

Fire in flight aboard an F-84-D Thunde jet during a training mission forced the pilo to bail out at 4,000 ft. altitude. When the fi first occurred, the aircraft was over Wes chester County and the pilot heroicall stuck with the plane until he was reasonabl sure it would crash into Long Island Sound He suffered severe burns as the flames fille the cockpit before his escape but he accom plished his objective as the F-84 explode on impact against a seawall. The pilot wa picked up from the water by a Larchmon Yacht Club launch. A section of the ex haust landed in the backyard of a Yonker resident just minutes after a mother ha called her four-year-old child indoors.

June 11, Memphis Naval Air Station, Tenn U. S. Navy, F7U-3, $500,000, 6 killed

Preparatory to an air show, an F7U Cut lass took off normally on a training fligh but after reaching 300 feet the pilot sud denly switched to his after-burners. The aircraft went into a bank and plunged side ways and downwards. It crashed through an aviation mechanics school building on the N.A.S. and stopped just short of the adja cent building. Fire was instantaneous with the impact. Four of the five aboard the aircraft were killed, one escaped with third degree burns on hands and face. Two per sons in the building were also killed, one

was trapped, another (a stenographer) was dragged from the fire but died an hour later because of burn injuries. All of the Naval Air Station fire forces worked on the blaze using water fog as the principal means of fire attack. Intense heat forced firemen to use hydrants 300 feet from the accident site. Occupants were removed within 45 minutes and the fire extinguished an hour later. Had the accident occurred 30 minutes earlier, there most probably would have been 200 students in the school building!

June 15, Gage, Okla. Great Lakes Airlines $400,000

Fire, originating in the accessory section of the No. 3 engine of a New York to Burbank, California nonscheduled DC-4 resulted in a skillful emergency landing at the small Gage Airport in Gage, Oklahoma, saving the lives of all 78 persons aboard. Despite darkness, thunderstorms, rain showers, the uncontrolled fire in one engine, the melting off of the engine mount, the dropping of the engine, a continuing fire in the wing and lack of radio power, the pilot brought the DC-4 down safely at the Gage Airport about 3:20 A.M.

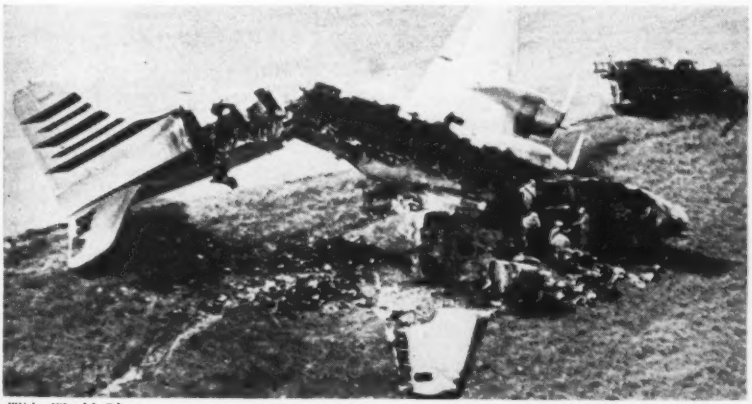
All 78 passengers scrambled to safety as the aircraft came to a stop off the runway with the right gear collapsed. Fire fighters were called by the Airport Manager and the Gage Fire Department arrived within 8 minutes from their in-town station, about 2 miles distant. The fire was brought under control with water fog and straight streams from two pumpers, saving the left wing, left engines and the empennage but the right wing and fuselage were destroyed.

Suspected cause of the in-flight fire was the generator in the No. 3 engine nacelle. Arcing apparently resulted in failure of a flammable fluid line in the accessory section and a severe fire developed. The carbon dioxide fire extinguishing system was operated, slowing the rate of combustion temporarily but failing to extinguish the fire. The No. 3 engine fell free in flight after engine mountings were weakened by the flame impingement. The engine was located about 11 miles from the point the aircraft came to rest. Fire continued in the wing cavity as the aircraft landed.

Full details are published in NFPA Special Aircraft Accident Bulletin Series 1954; No. 1 (available from the Association for 25 cents per copy).

June 22, Clovis A.F.B., N. M. U. S. Air Force, F-86F, $700,000, 1 killed

Missing a farmhouse, a Sabrejet crashed about 1,500 feet off the runway of the Clovis Air Force Base. The pilot was killed in the flaming wreckage. No other details were released.



Wide World Photo

Fire in flight caused this emergency landing at a small Oklahoma airport on June 15. Seventy-eight persons miraculously escaped without injury.

June 27, Box Spring Mountain, Calif. U. S. Air Force, KC-97, $1,500,000, 14 killed

A crew of seven and seven passengers aboard a KC-97 "Stratotanker" were killed in an explosive crash on Box Spring Mountain at 3:08 A. M. The aircraft was en route to San Bernardino Air Force Base but hit the mountain at the 3,000-foot level. The tanker was on a training flight and did not have its full load of fuel but the fire was intense from the plane's own fuel supply. Helicopters were used to retrieve the bodies because of the rugged terrain of the accident site.

July 2, Walesville, N. Y. U. S. Air Force, F-94C $700,000, 4 killed

Fire in flight aboard this "Starfire" jet forced the crew of two to bail out suddenly while returning to Griffiss Air Force Base after identification of an unknown aircraft in the area. Successful parachuting should have made this a non-fatal accident but the stricken aircraft hit and sprayed with flaming gasoline two dwellings and a passing car at a country corner in Walesville. One woman in one of the dwellings and three persons in the car were burned to death. Occupants of the second dwelling were able to escape in the few seconds before the fire blocked their way.

July 7, Kansas City, Kans. U. S. Air Force, F-84F $400,000, 4 killed

Three dwellings and several cars were destroyed when a jet, out of control, crashed into a residential section of Kansas City.

The jet had taken off from Fairfax with three others after USAF acceptance of the newly assembled aircraft. The flight leader advised the tower one of the jets was in trouble and would return to the airport. Unfortunately, control could not be maintained by the pilot and an eye witness flying in the vicinity noted the F-84F in a sharp dive. It narrowly missed a 9-story building hit trees, sliced off the second story of one dwelling, struck the ground and two automobiles, smashed into one dwelling, burst into flames and veered into another house.

A third dwelling exposed to the fire caught fire. The pilot and three residents of the dwellings died in the flaming wreckage and nine civilians and two firemen were injured.

July 10, near Sault Ste. Marie, Mich. U. S Air Force, F-89 $1,000,000

A near miraculous escape occurred afte this F-89 Scorpion developed a fire in fligh The pilot and observer rode the jet fighte to a crash landing in a wooded area abou a mile away from the Kinross Air Forc Base, after realizing their altitude was in sufficient to permit bailing out. They blev off the canopy to facilitate escape and wer able to scramble out with one only sufferin burns. The aircraft was destroyed.

July 11, Randolph A.F.B., Tex. U. S. Ai Force, B-29 $750,000

With one engine on fire on take-off an loss of power on a second at under 4,00 feet, the pilot elected to attempt a crasl landing on an open field off the end of th runway. Of the crew of 15, only two wer badly burned, the other 13 escaping unhur The aircraft was destroyed.

July 12, near Rockport, Mass. U. S. Navy $250,000, 1 killed

An anti-submarine bomber on a routin training instrument flight caught fire o Rockport. The wreckage was strewn over half-mile area after missing a Coast Guar tower. The pilot was killed in the crash It appeared that the plane was out of contro following the outbreak of fire in flight.

July 23, Williams A.F.B., Tex. U. S. Ai Force, F-84 $400,000, 1 killed

Only scant details are available of thi accident when a Thunderbolt crashed int the officers' housing section at the Air Forc Base and burned. A child was killed and were injured on the ground. Two house were destroyed and a third damaged. Th pilot had bailed out after engine trouble i flight.

Aug. 3, Wantagh, N. Y. U. S. Air Force F-84G $400,000, 1 killed

The aircraft was flying in a flight of fou when it left formation at 32,000 ft. and dis appeared from the others. The plane crash ed and burned in the middle of a residentia street between a row of dwellings at 11:2 A.M. The aircraft disintegrated upon im pact and 600 gallons of JP-4 fuel were scat

Connecticut State Police

An attempted emergency landing of an Air France Constellation resulted in a severe crash fire on a farm in Preston, Conn., Aug. 3. Volunteer firemen rescued 2 passengers; 35 other occupants escaped unassisted.

tered in an atomized spray. A series of blasts accompanied by flash fires shattered three houses, killed the pilot and injured a number of the residents. Fire damage occurred to the exposed dwellings and a car. Fire fighters who responded had been trained in aircraft rescue and fire fighting at near-by Mitchell Air Force Base under a vocational educational program sponsored by Nassau County. The fires were extinguished quickly by using water fog and straight streams. Twelve pumpers and 250 firemen and rescue workers responded to the alarms given by telephone and radio by those who observed the crash.

Aug. 3, Preston, Conn. Air France, Constellation, $1,005,000

An attempted emergency landing in Preston, Conn., following an overseas flight from Paris and missed approaches at New York International Airport, resulted in a serious crash fire. Amazingly, and because volunteer firemen had the courage to attempt rescues, no fatalities occurred among the 37 occupants. The Preston Volunteer Fire Company District No. 1 was the first on the scene after the aircraft jumped and skipped along through open fields and finally came to rest after demolishing a two-car frame garage and hen house. When the firemen reached the scene (after being alerted by the aircraft circling the area searching for an open field), the aircraft was seriously involved in flames. Fortunately the fuselage had broken in two behind the cockpit. Most of the occupants had escaped unassisted but two passengers were still in the wreckage. One of the two was still strapped to his seat with his safety belt and was unconscious. Seven or eight firemen worked as a team under protection of water fog to remove the unconscious and the injured occupant. The second person, a woman, was removed without much difficulty as she was able to walk. During this rescue effort, firemen were nearly driven back two or three times by heat and wing fuel vapor explosions but they completed their rescue mission.

Chief Arthur Barry of the Preston Department had a heart condition restricting his ability to continue the active direction of the fire fighting. The Voluntown (Conn.) Fire Department arrived during the interval and Chief Kaufman took over at the request of Chief Barry. The crew of the aircraft and other observers (including the State Police) did not advise Chief Kaufman if others were trapped. Under his direction, firemen re-entered the burning aircraft after someone told him 10 adults and two babies were still in the plane. This information turned out to be incorrect and the operation subjected the volunteer fire fighters to a needless degree of hazard and punishment which could have been prevented had the aircraft crew advised the Chief of actual

conditions or had the State Police on the scene co-ordinated the rescue operations.

Firemen then started to try to save baggage and mail using water fog and wet water to cool the smoldering cargo and, by a human chain, removing the material from the fire area. The Chief was advised against this action as the aircraft was a foreign ship and the baggage had not been cleared through U. S. Customs. He, correctly, assumed responsibility but was much annoyed by orders to "let it burn" relayed to him by the State Police from a CAA representative and by the refusal of local Post Office officials present to assume responsibility for the 25,000 pieces of mail, 90 per cent of which the fire fighters were able to save. It is clear from this accident that measures must be taken to clarify the authority and responsibility of the agencies concerned when a foreign aircraft is involved in an accident of this type on U. S. soil. Preston, Connecticut has no U. S. immigration or customs officials but the emergency demanded intelligent, direct and constructive action to preserve life and property and Chiefs Barry and Kaufman are applauded for their effective roles in this strange accident. Remembering that their men are all volunteers with no previous experience in aircraft rescue and fire fighting, the whole story is a high tribute to the typical services rendered by volunteer firemen throughout the country.

Aug. 23, near Pickering, Ont.. A. V. Roe Canada Ltd. CF-100 $500,000, 1 killed

On its first flight after coming off the assembly line, a CF-100 jet fighter plane burst into flames in the air and crashed near this village. The test pilot bailed out using his ejection seat-parachute but the flight test observer was killed in the high speed crash impact accompanied by an explosion and intense fire.

Aug. 27, near Ellsworth A.F.B., S. D. U. S. Air Force, B-36 $3,500,000, 26 killed

While attempting a landing at the Ellsworth Air Force Base, a B-36 struck a small hill and burst into flames. Twenty-four men died in the burning wreckage. Of the three who escaped, two subsequently died of burns and injuries. The initial ground contact did not appear to be severe but reports indicate an explosion occurred almost instantly and this scattered the wreckage, with the main fuselage section heavily involved in flame.

Aug. 29, near El Paso, Texas U. S. Air Force, B-36 $3,500,000, 1 killed

Because of a number of engine fires in flight, the pilot of a B-36 requested permission to make an emergency landing at the El Paso International Airport. Loss of power resulted in the ten-engine plane striking a power line and crashing short of the runway. Fifteen of the sixteen crew members were able to escape (with injuries) before a severe fire engulfed the crashed plane. This was the second B-36 accident in a little less than 26 hours and, according to press reports, the fifteenth of a series of B-36 crashes which have caused about 160 deaths.

Sept. 21, near San Bernardino, Calif. U. S. Air Force, C-82 $250,000, 1 killed

The pilot of a C-82 was killed after a fire in flight caused the two-engine cargo plane to crash in the mountains near San Bernardino. The pilot stayed with the plane while eight crew members bailed out. All eight were not located until 12 hours after the crash, a severe forest fire ignited by the crashed plane delaying the search.

Sept. 21, Otis Air Force Base, Mass. U. S. Air Force, 2 F-94's, $1,400,000, 2 killed

One F-94C made a routine night landing on the runway at Otis Air Force Base under instrument conditions but a tire blew out after touch down and the aircraft came to an abrupt stop in the center of the runway. The tower could not see the helpless aircraft and the pilot apparently was unable to make radio contact with the tower (or perhaps did not feel it desirable to turn on electric power). A second jet was cleared to land and then a third. The second made a safe short landing but the third crashed into the first and fire resulted. The two crewmen in the third plane were killed.

Sept. 25, Smoky Hill A.F.B., Kans. U. S. Air Force, B-47 $3,000,000

After a successful night landing, a B-47 ran off the end of the runway, hit a shallow ditch and burst into flames. The entire plane was destroyed but all three crew members escaped unassisted.

Wide World Photo

With a burning engine, a C-119 "Flying Boxcar" failed to make a safe attempted emergency landing at Fort Bragg. Two were killed.

Oct. 6, Fort Bragg, N. C. U. S. Air Force, C-119 $250,000, 2 killed

With a burning engine, a C-119 "Flying Boxcar" attempted an emergency landing at Fort Bragg. The crippled plane just missed striking a barracks building under construction and landed in the street. The fire which resulted was relatively quickly controlled but two of the crew (captain and co-pilot) were killed. Ten others aboard the C-119 and 4 civilians were injured.

Oct. 6, near Willows, Calif. U. S. Air Force, B-50 $850,000, 13 killed

No details are available on this accident which took 13 lives. The B-50 was apparently in trouble before the crash impact as three crewmen parachuted to safety. The aircraft was in flames when first seen by ground observers.

Oct. 7, near Chicago, Ill. U. S. Air Force, F-86 D $700,000

The pilot of a burning F-86 D prevented the disabled plane from crashing into the metropolitan area and parachuted to safety seconds before it was too late. The crash site was on a farm ten miles west of O'Hare Field on the northwest side of the city.

Oct. 8, Langley A.F.B., Va. U. S. Air Force, F-94C $700,000, 2 killed

At 10:25 P.M. an F-94C "Starfire" crashed and burned just short of the runway after a local training flight of less than two hours. The pilot died on the site and the observer several hours later in the base hospital.

Oct. 12, near Lancaster, Calif. North American Aviation $1,000,000, 1 killed

A test pilot of World War II was killed trying to escape from a Super-Sabrejet F-100 after an in-flight explosion. The pilot was critically injured after yanking his parachute open. No further details are available.

Oct. 12, Clinton, Md. U. S. Air Force, F-86 $700,000, 5 killed

An engine fire aboard an F-86 resulted in a tragic accident which caused the death of the pilot and four members of a family which lived in a small dwelling in Clinton. Two children, aged two and four, were burned to death by a shower of burning gasoline as they were playing in their back yard. Their mother was fatally burned as she was hanging up clothes in the yard. The husband suffered second and third degree burns and died about a month and a half later. The Air Force announced that "a malfunction of an electronic control caused an excessive surge of fuel during the last moments of the take-off and led to an engine fire of very great intensity."

Oct. 21, Chicago, Ill. United Air Lines, DC-6 $400,000

During a refueling operation, a break in the fuel hose from an underground fueling

Hayden Kelly

A fuel spill occasioned by failure of a hose from an underground fueling system caused this fire at Midway Airport, Chicago on October 21. The fueler was badly burned but nine passengers and the crew escaped safely from the DC-6.

Hayden Kelly

A low pressure carbon dioxide crash truck at Chicago's Midway Airport was a major factor in saving a highly valued DC-6 on Oct. 21 after a fueling fire (see other pictures opposite and below).

pit sprayed gasoline under pressure on the No. 4 engine of a DC-6, over, under and against the fuselage, and over a baggage cart and tractor which were servicing the aircraft. Fire broke out almost immediately.

The fueler jumped off the wing trailing edge, his clothes ablaze. Fortunately he was caught, his clothing fire smothered and he was rushed to the hospital. Nine passengers aboard the Seattle to New York through flight filed out the regular exit door under the guidance of the Stewardess and flight crew. Cause of the fuel hose break was apparently a high pressure surge on the 2½-inch hose leading from the hydrant to a supplementary fuel hose cart. The initial break was no more than a pin point but suddenly a split three inches long appeared.

The fuel sprayed until several control switches were operated to close down the entire underground fuel supply system (including pumps). The fire burned 20 to 30 minutes before it was extinguished by the airport carbon dioxide crash truck and five hose lines. Complete details on the fuel system, hose pressures and amount of gasoline con-

Chicago Daily News

The extent of damage caused by the fueling fire in Chicago is clear in this picture. It is understood the DC-6 is being shipped by barge to Santa Monica, Calif. via the Mississippi and Panama Canal for repair.

Official U. S. Navy Photo (United Press Telephoto)

Fire damage to this $9,000,000 "flying radar laboratory" was practically total after a rather mild impact at Johnsville Naval Development Center (Pa.). Twenty occupants escaped safely through doors and hatches.

sumed have been withheld by the operator up to the present time.

Oct. 29, Olathe, Kans. U. S. Air Force, B-47E $3,000,000, 3 killed

No details are available on the flaming crash of a B-47E which crashed about eight miles from Olathe killing three of the four crewmen aboard. One crewman parachuted from a low altitude and was injured as he hit the ground.

Nov. 2, Norfolk Naval Air Station, Va. U. S. Navy, Skyraider $500,000

An engine failure at take-off was believed responsible for this accident when a Douglas Skyraider crashed and burned at the Naval Air Station. The three crew members were seriously burned.

Nov. 4, San Diego, Calif. Convair, YF2Y1 over $1,000,000, 1 killed

An in-flight structural failure and fire killed a test pilot demonstrating an experimental delta wing Convair seaplane called the "Sea Dart." The jet fighter, built for the Navy, crashed into San Diego harbor. The Navy launched a full investigation to try to determine the cause of the tragedy to the "Sea Dart," believed to be the world's fastest seaplane.

Nov. 22, Essex, Md. Glenn S. Martin B-57 $1,000,000, 2 killed

Incomplete reports indicate that a B-57 jet bomber exploded in flight while circling to land at the Martin Airport after a routine test flight. The burning aircraft crashed in the back yard of a private home and badly damaged the dwelling before fire fighters could extinguish the flames. Fortunately, the occupants (including three children) were able to escape before their exit was blocked. The two crew members were found in the burned fuselage.

Nov. 27, near Dover, Del. U. S. Air Force, F-86F $700,000

Within minutes of take-off, an F-86F crash landed in a field less than three miles from the Air Base. The pilot was able to walk away from the burning aircraft.

Dec. 9, Johnsville Naval Development Center, Pa. U. S. Navy Super Constellation, WV-2 $9,000,000

Twenty occupants of a "flying radar laboratory" aboard a Navy Super Constellation escaped after the aircraft crashed and burned while landing at the Naval Station. All the occupants escaped unassisted through doors and hatches despite the fact that the aircraft flipped over after the landing. The radar equipped plane was valued at $9,000,000 because of the special nature of the "laboratory" equipment aboard.

Dec. 17, near Brampton, Ont. Trans Canada Air Lines, Super-Constellation $1,250,000

The Super Constellation with 23 persons aboard was approaching Toronto en route from Tampa, Florida when it crash landed in a frozen field. Incomplete information is available as to whether fire preceded the impact but an explosion and fire did follow the ground contact. How the 16 passengers and 7 crew members escaped from the burning wreckage is difficult to explain.

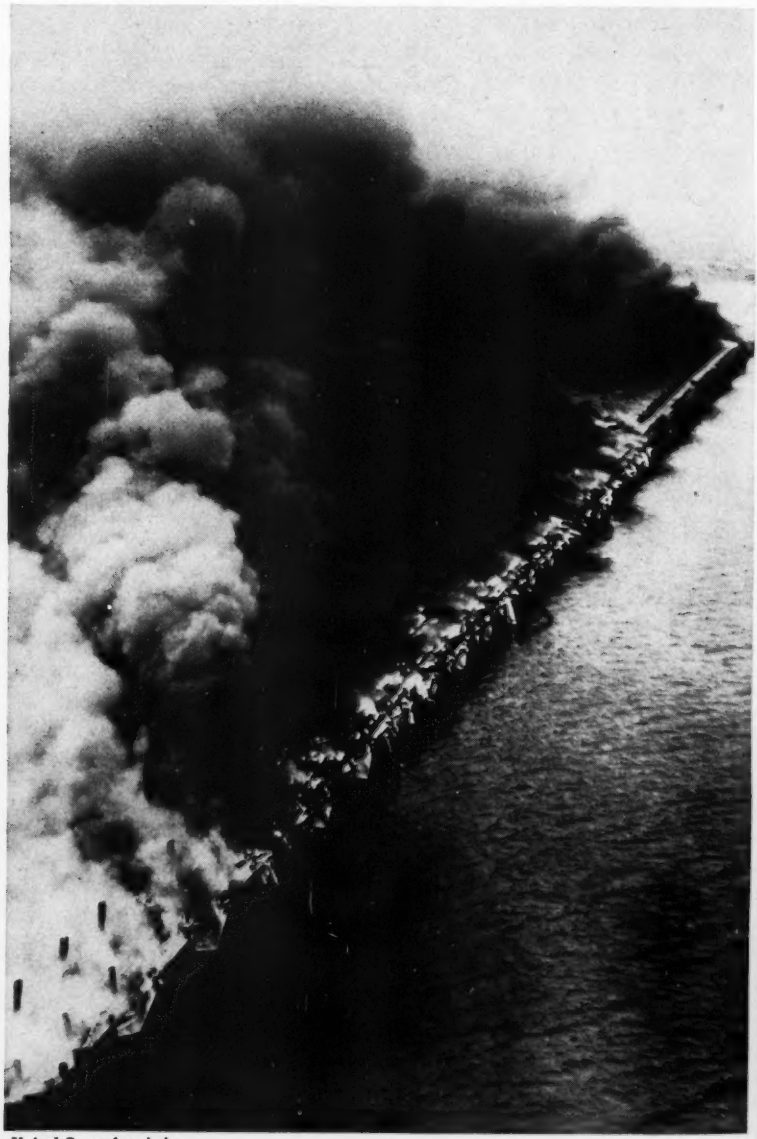
Dec. 18, New York, N. Y. Italian Airlines, DC-6B $1,250,000, 26 killed

A missed approach at the New York International Airport resulted in this accident when a DC-6B en route from Rome struck a pier supporting the "slopeline" approach lights and burst into flames. Intense fire followed an initial and second impact on the pier and only six survivors could be rescued. The 2,000-foot-long pier presented difficult fire fighting problems and rescue work was hampered by the smoke and flames on the wooden pier and in floating gasoline on the water surface. The crash came after the pilot had made three previous attempts to land on Runway 22 at Idlewild but each time he was advised that his aircraft was improperly aligned to make a safe landing.

Dec. 29, near New Hope, Ala. U. S. Air Force, C-119 $250,000, 9 killed

While flying through bad weather something happened aboard a C-119 which caused it to crash to the ground trailing flames. Two airmen sitting in the rear of the plane were able to parachute to safety but the nine others were killed in the crash.

Fire damage to this $9,000,000 "flying radar laboratory" was practically total after a rather mild impact at Johnsville Naval Development Center (Pa.). Twenty occupants escaped safely through doors and hatches.



United Press Association

An Italian Air Line DC-6 hit this "slopeline" pier at New York International Airport after three previous unsuccessful approaches on Dec. 18. The pier loss is estimated at $1,250,000.

Railroad and Ship Fires

The most disastrous fire of the year occurred aboard the *USS Bennington* where 106 were killed and 119 injured. The number of deaths in this fire was the greatest since the West Frankfort, Illinois coal mine explosion of December 21, 1951 in which 119 were killed. The tank car explosion in Portland, Oregon was also one of the most significant fires of 1954 particularly since the cause could be accurately pinpointed. These two fires are among the three transportation fires summarized below.

Other fires involving transportation equipment will be found in the reports on terminal warehouses, petroleum storage, piers and wharves, and aircraft.

Railroad Rolling Stock

Oct. 18, Portland, Oregon, Seattle, Portland & Spokane Railroad, et al. $330,000

21 box cars, two 80,000 barrel fuel oil tanks. At 3:48 A.M. LP Gas leaking from a railroad tank car exploded. The explosion and resultant fire demolished or damaged 21 box cars. Two 80,000 barrel fuel tanks 60 ft. from the tank car were distorted and windows over a wide radius were broken. Fires broke out in wooden box cars and in combustible freight.

The explosion occurred as freight cars were being "spotted" in the railroad yards. Preceding the explosion a blowing sound was heard and a vapor cloud was seen to spread out from the leaking tank car for a distance of about 200 feet. When the vapors reached a kerosene-fueled switch lamp, flames flashed back through the cloud and

Portland Fire Dept.

Explosive ignition of LP Gas that had leaked from a railroad tank car caused extensive damage at Portland, Oregon, October 18. Photo shows LP Gas burning harmlessly at the tank car vent at 1:00 P.M., nine hours after the explosion. The tank car was not damaged by the explosion.

reached explosive violence after traveling a few feet. Conventional fire fighting methods were used to extinguish the fire in freight cars. Water sprays were used to cool tank cars. Fortunately, none of the LP Gas tank cars was damaged by the explosion, and the only fire involving these cars was at the dome of the leaking car. Vapors continued to burn at this car until 4:30 P.M.

Upon examination of the leaking car it became evident that the leak resulted from a broken safety relief valve stem.

NFPA GASES FIELD SERVICE FIRE LOSS BULLETIN, Series 1954-1, contains a detailed report of this accident.

Ships

Dec. 17, Baltimore, Md. Arundel Corp. $250,000

Dredge, two tugs, two barges. Fire originating in the galley of the dredge "Defender" destroyed the dredge and a tug and heavily damaged a tug boat and two barges. The group of vessels was moored 30 ft. off shore during the night. Since the crews were all asleep and no watchman was on duty, the fire was not discovered until seen by a passing motorist at 2:38 A.M. Firemen used a catwalk and a rowboat to put hose lines aboard the vessels. Shallow water delayed response by the fire boat.

May 21, 75 miles south of Newport, R. I. United States Government $2,000,000; 106 killed, 119 injured

27,100-ton aircraft carrier. As aircraft were being catapulted from the flight deck of the carrier an explosion occurred in the internal hydraulic circuit in the port catapult room. A series of violent explosions (apparently involving hydraulic liquid in mist form released from the damaged hydraulic equipment) then occurred which shook the ship.

All metal joiner bulkheads, ventilation ducts, and furniture on the second deck, and a considerable amount on the third and fourth decks were destroyed. Metal ladders and access hatches were twisted and torn into shreds. The flame from the blast was of such intensity as to penetrate the flame-tight doors on the bomb elevator hatch on the second deck.

The duration of the fire was very short and most personnel casualties were caused by flash burns, fractures or carbon monoxide poisoning. The most likely cause of the incident was compression ignition similar to the action taking place in a Diesel engine. However, other causes of ignition cannot be disregarded and, therefore, very extensive tests and research are being conducted. This incident was very similar to the USS Leyte explosion which occurred in October of 1953 killing 39. (January 1954 QUARTERLY, page 317.)

Twenty-Six Other Big Fires in 1954

In addition to the large loss fires of 1954 that have been grouped and discussed in separate articles in this issue of the QUARTERLY there were twenty-six fires distributed among 13 diverse occupancies, i. e., two armories, four bowling alleys, one building under construction, one coal mine, one country club, two electric generating plants, six forest fires, two laboratories, one laundry, two office and bank buildings, one oil well, two piers and one race track stable.

There were 17 killed in these 26 fires; 16 deaths occurred in the Farmington, W. Va. coal mine disaster. The total loss from these fires was $14,221,500.

Individual reports of the fires follow.

Armories

Nov. 19, Warrensburg, Mo. Warrensburg Armory $400,000

Armory. At 8:11 P.M., when firemen answered an outsider's alarm, fire had involved the entire basement of the 75,000 sq. ft. 2-story stone, wood-joisted building. The basement was filled with trucks and jeeps. Since flames were belching from the ramp in the rear, the only entrance to the basement, firemen cut holes in the first floor in an effort to get water on the fire. By the time the holes were cut, the first floor was not tenable and fire fighting had to be continued from outside. Flames eventually burned up through the building.

Dec. 26, near Kingston, Ont. Canadian Government $400,000

Army drill hall with ammunition and motorized equipment storage. Violation of

This Windsor, Ontario bowling alley fire originated in the pin refinishing room when an accumulation of lacquer dust was ignited. Fire flashed from the not-cut-off refinishing room to the alley section.

a cardinal rule of fire protection, prompt fire department notification, played an important part in the destruction of this unsprinklered and undivided 31,725 sq. ft. 1-story wooden building. On discovering the fire at 12:30 A.M. two security guards tried to put it out by themselves, thereby delaying fire department attack until the building was beyond saving. Army and municipal fire fighters concentrated on saving exposed wooden buildings being showered with sparks. A fallen 550-volt electric wire and exploding ammunition hampered efforts to bring the fire under control.

Bowling Alleys

Jan. 14, Windsor, Ont. Palace Recreation, Ltd. $289,000.

32 bowling alleys. At 10:59 A.M., while employees were refinishing bowling pins in a back room, a spark or arc from a lathe motor ignited lacquer-impregnated dust that had accumulated when bowling pin finish was removed with steel wool. The three employees tried to smother the blaze with a blanket but flames spread through the dust so rapidly that they had to flee. Fire flashed through the finishing room doorway (in which a curtain was hung) and entered the alley section. Flames also entered the undivided attic and were beyond control i the undivided and unsprinklered 21,800 sq ft. 1-story masonry, steel-framed buildin when firemen arrived minutes later.

Jan. 29, Sudbury, Ont. Norland Bowlin Lanes, et al. $324,000

Bowling alleys, grocery, launderette, res taurant. At 1:50 A.M. a janitor redecoratin the first floor restaurant stepped outside fo a minute to see if his car had been tagge for all-night parking, and, to his surprise noticed flames in windows of the bowlin alley on the second floor of the 3,750 sq. f unsprinklered 2-story brick, wood-joisted build ing. Since there were no fire alarm boxes an a telephone was not available at that time o night, it was necessary to drive to the fir station to give the alarm. Firemen had jus entered the first floor grocery store when a explosion of fire gases in the store blew them into the street, injuring five. Flame immediately enveloped the grocery.

Nov. 7, Christiansburg, Va. Christiansburg Recreation Parlor $250,000

Bowling alley, furniture store, variety store, apartments. The fact that people live on the upper floors of a building does not assure prompt discovery of a fire that may

The Sudbury Daily Star

Fire was beyond control in the second story bowling alleys in this Sudbury, Ontario building when it was discovered at 1:50 A.M. No private fire protection was provided.

St. Louis Post Dispatch

Steel roof trusses collapsed a short time after fire was discovered by pin boys in this St. Louis bowling alley. The fire originated in the undivided concealed roof space.

start below them. In this instance fire had involved most of the bowling alleys occupying the basement of the unsprinklered 12,500 sq. ft. 2-story brick, wood-joisted building before occupants of a second story apartment were awakened by smoke at 2:35 A.M. Everyone escaped safely. The furniture and variety stores occupied the ground floor portions of the structure. The usual difficulties that confront firemen when fighting basement fires were present in this instance. With heat and smoke coming up through the basement entrances, it was impossible to get into position to put water on the fire. Eventually the fire burned through the floors and broke through the roof.

Dec. 6, St. Louis, Mo. Melene Recreation Parlor, et al. $493,500

Bowling alley, retail hardware and building supplies. A fault with a ceiling light in the second story bowling alleys was the reported cause of fire that destroyed the roof and second story of the unsprinklered 24,800 sq. ft. 2-story brick building. The fire had enveloped the undivided space between the ceiling and roof when it was discovered by pin boys at 9:27 P.M. A short time after discovery unprotected steel roof trusses collapsed.

Building Under Construction

Dec. 10, Detroit, Mich. Detroit Water Dept. $500,000

Low-lift water pumping station under construction. While this circular building (104 ft. diameter, 55 ft. above grade, 135 ft. below grade) was under construction fire broke out. It is assumed that the fire originated when a tarpaulin or a wood plank on staging was ignited by a gas-fired salamander. There were 14 salamanders in use (temperatures around 32°F.) at the time. As the fire spread through wooden scaffolding (225, 2 inch by 10 inch planks on steel supports) it was intensified by gas from 48 cylinders of LP Gas that were in the building. All the cylinders fell 30 feet to the working floor from their positions on the scaffolding; six of these ruptured, others were damaged or had the valves knocked off allowing the gas to escape. It is estimated that as much

as 30,000 cubic feet of gas escaped. The scaffolding was destroyed and the large unprotected steel roof members in the roof failed due to the heat. This failure resulted in a total loss of the roof structure and a partial loss of the upper wall. The fire is expected to delay operation of the pumping station for six months.

Coal Mine

Nov. 13, Farmington, W. Va. Pittsburgh Consolidated Coal Co. over $250,000, 16 killed

Coal mine. While a maintenance crew was at work about a mile and a quarter from the shaft entrance a violent explosion occurred that trapped and killed the 15 men in the crew. The other fatality involved a man standing in the fan house at the surface. He was killed by falling debris when the fan house was collapsed by the explosion. The mine has been sealed since the fire broke out, preventing investigation of the cause and extent of damage.

United Press

The only "large loss" club house fire in 1954 occurred at Glenwood Landing, N. Y. There were four club fires in 1953. Flames had broken through the roof before the fire was discovered.

Globe and Mail

On April 1, at a Toronto, Ont. electric generating plant, a retaining ring on the rotor field broke, causing severe damage to a generator. Released lubricating oil and hydrogen coolant ignited.

Country Club

Jan. 19, Glenwood Landing, N. Y. Rolling Wood Golf Club $250,000

Golf clubhouse. This rambling 1-story brick and wood building was destroyed by fire that originated in central living quarters and spread rapidly in both directions. When first noticed, shortly before 10:00 A.M., the flames had broken through the roof. One of the golf pros discovered the blaze as he passed the building. Kitchen employees were the only persons inside.

Electric Generating Plants

April 1, Toronto, Ont., The Hydro-Electric Power Commission of Ontario. $3,000,000.

Steam-powered electric generating plant. At 6:14 A. M. while the load was being raised from 5 mw to 10 mw on a 300 mw turbo-generator in a steam-powered electric generating station, the rotor field coil retaining ring (54-in. diam., 2¼-in. thick) on the exciter end fractured along three ventilating holes on the periphery of the ring. Centrifugal force drove the broken ends of the ring outward. Supporting teeth for the conductor bars on the rotor broke away and conductor bars were forced to the center of the rotor until internal seizure destroyed the stator and windings and lifted the 160 ton rotor 12 inches on one end. Broken oil supply piping and hydrogen shaft seals allowed lubricating oil and hydrogen coolant to escape around the generator foundation. Fire quickly developed. Approximately 3,000 gals. of oil were released from the auxiliary oil pump that automatically took over when the oil pressure dropped while the turbine was running down. Operating personnel and city firemen were able to confine the fire to the area of origin until all the oil was consumed and the blaze extinguished.

April 4, Toronto, Ont., The Hydro-Electric Power Commission of Ontario. $800,000.

Steam-powered electric generating plant. The same type of mechanical failure and fire that occurred on April 1, 1954, at this steam-powered electric generating station caused the destruction of another generator three days later. The rotor field coil retaining ring on the exciter end of a 200 mw generator failed at the ventilating holes in the ring. Severe vibration resulted followed by an explosion and fire. In this case the supporting teeth for the conductor bars did not break and no seizure of the rotor to the stator oc-

Canadian Press

Two "large loss" electric generating plant fires at Toronto occurred under almost identical conditions in April. Oil ignited following mechanical failure.

United Press

The six forest fires of 1954, including this one at the San Bernardino National Forest, Dec. 27, caused $3,994,000 loss.

curred. Again the oil lines and hydrogen seals were broken and both oil and hydrogen escaped around the foundation of the generator. The auxiliary oil pump was shut but not before 1,800 gals. of oil were released. Fire was confined to the area of origin. The building had considerable structural damage from flying debris and heat from the fire.

Forest Fires

June 3, Tozitna, Alaska U. S. Department of the Interior $1,524,500

469,120 acres. A lightning strike started fire that burned 117,280 acres of forest land, 234,560 acres of brush land and 117,280 acres of tundra and swamp land.

June 6, Paimuit, Alaska U. S. Department of the Interior $419,500

249,900 acres. Twenty-four per cent of the 262 fires within Interior Alaska in 1954 were set by lightning. This fire at Paimuit that burned 29,900 acres of forest land, 60,000 acres of brush land, 60,000 acres of grassland and 100,000 acres of tundra and swampland was set by lightning.

July 15, near Chatsworth, N. J. State of New Jersey, et al. $600,000

23,800 acres pine forest; cranberry bogs. A forest fire of unknown origin destroyed 23,800 acres of timberland and three dwellings. It caused an estimated $100,000 damage to cranberry bogs in the neighborhood.

Sept. 25, San Bernardino National Forest, Calif. $600,000

5,200 acres. This fire was purposely set. Cost of suppression was $200,000.

Oct. 10, Los Padros National Forest, Calif. $325,000

13,880 acres. Careless smoking was the cause of this fire that destroyed 13,880 acres of timber and watershed.

Dec. 27, Cable Canyon, Calif. San Bernardino National Forest $525,000

A "power line" was given as the cause of this fire that destroyed valuable ground cover. Cost of fire suppression was $100,000, not included in the $525,000 loss estimate.

Laboratories

April 19, near Willow Run, Mich., University of Michigan, et al. $400,000.

Engine and fuels research laboratory. Research for the U. S. Government was interrupted by fire that destroyed the unsprinklered 9,600 sq. ft. 1-story, wooden building. The fire originated in the attic and because no sprinklers or subdivisions were provided, spread to all parts of the building by way of the undivided and combustible attic. Discovery was by a security guard at 11:00 P.M. By then the building was beyond saving.

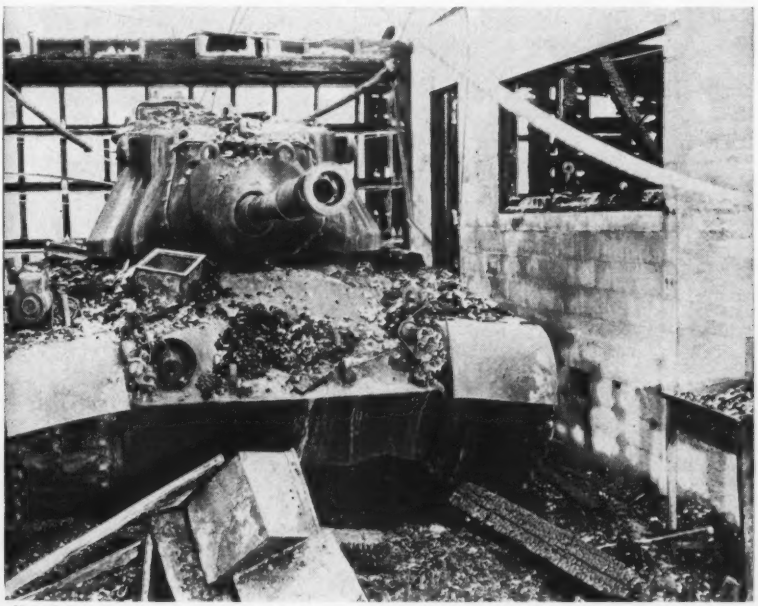
Nov. 14, Los Angeles, Calif. McCulloch Motors Corp. $300,000

Research and testing laboratories for gasoline engine manufacturing. A wiring fault in a loud speaker amplifier in a first floor office was the cause of fire which destroyed much of the interior finish of the 11,250 sq. ft. 1- and 2-story building and heavily damaged laboratory equipment. The fire broke out on combustible fibreboard finish on which the amplifier was mounted and when discovered by the watchman on his 10 P.M. round had spread through an open doorway to the combustible fibreboard insulation on the hallway walls and ceilings. After calling the fire department, the watchman attacked the blaze with extinguishers but was subsequently forced from the building as flames spread rapidly through the hallway and into laboratories through blocked open fire doors.

Laundry

Feb. 17, Columbus, Ohio General Laundry and Dry Cleaning Co., Inc. $375,000

A carelessly discarded match or cigarette was the probable cause of fire that originated in a cardboard drum used as a waste-paper basket. The fire was discovered by the plant watchman on one of his regular tours. Fire spread rapidly along lint-covered walls and ceilings and was soon beyond control in the unsprinklered 2-story brick, wood-joisted building.



United Press

Fire originated in and spread through the undivided and unsprinklered attic at this laboratory near Willow Run, Michigan.

Steve Buckley

Originating in a cardboard drum of waste paper, fire at this Columbus, Ohio laundry spread rapidly along lint-covered walls and ceilings.

At 9:00 P.M. the last employee to leave lit a cigarette with a match and tossed the still-burning match into a large cardboard container of paper and other rubbish in the first story of the unsprinklered 5000 sq. ft. 2-story brick, plank and timber building. The fire was discovered 10 minutes later by the watchman, but, by then, it was too late to prevent its rapid spread over the lint-covered walls and ceiling of the second story.

Office and Bank Buildings

March 24, Provo, Utah First Security Bank Building, et al. $356,000

When this 14,000 sq. ft. 2- and 3-story brick, steel-framed building was converted from a hotel to its present occupancy in 1950, it underwent extensive alterations including installation of acoustical tile ceilings suspended five feet below the original ceilings and installation of combustible fibreboard wall finish. Renovation did not include installation of automatic sprinklers or automatic fire detection equipment.

The fire originated in the 5-ft.-high space above the ceiling on the second and third floors and spread through this space until it broke out into the open and was seen by an outsider at 1:20 A.M. Firemen took hose lines into the building but after 10 minutes had to leave because of the smoke and threat of building collapse. Shortly after the last man left, the roof, second and third floors collapsed.

Nov. 4, Nashville, Tenn. Exchange Building $300,000

96 offices, restaurant. Careless disposal of smoking material was the probable cause of fire that originated in the ladies' rest room on the first floor of the unsprinklered 6- and 7-story brick, wood-joisted building. The fire was discovered shortly after 4:00 A.M. by the waitress of a tavern in an adjoining sprinklered building that communicated with the fire building through several openings in the first four stories and basement. Had the fire department been called at once the fire probably could have been confined to the rest room. However, the waitress's employer elected to

Nohr Photographers

Fire in this Provo, Utah office and bank building originated in the 5-ft.-high concealed space above the acoustical tile ceiling.

put out the fire himself and delayed fire department notification until it started to spread out of the rest room. Flames had involved the first floor and were going up an open elevator shaft to upper stories by the time hose streams were in operation. During the fire, sprinklers in the adjoining sprinklered building operated at fire wall openings, all of which were protected either by double or single fire doors, and kept fire from the sprinklered building.

Oil Well

Oct. 26, near Ma-Me-O Beach, Alta. Texaco Products Co. $500,000; 1 killed

Oil and natural gas well. One man was killed and three were seriously injured when the well burst into flames and enveloped the drilling rig on which they were working. After 10 days of uncontrolled burning during which an estimated 10,000,000 cubic feet of gas was consumed daily, the fire was extinguished by exploding a 300-lb. shot of nitroglycerin.

Piers and Wharves

April 19, Houston, Texas Laporte Yacht Basin $400,000

Thirteen yachts at finger pier. An explosion aboard a 40-ft cruiser, one of sixteen boats in adjacent slips of a roofed finger pier, scattered burning gasoline that set fire to the pier and adjacent boats. Fire spread so rapidly that only three boats at the outer end of the pier could be pulled to safety. The thirteen burning boats sank as fire

A "large loss" pier fire of 1954 occurred at Atlantic City, N. J., August 31. The destructive fire followed an explosion aboard a boat tied up at the pier.

fighters found it practically impossible to get water on the fire once the metal roof of the pier collapsed. It is presumed that the explosion that preceded the fire occurred when an accumulation of gasoline vapors was ignited by sparks from a refrigerator motor.

Aug. 31, Atlantic City, N. J. McGarrigel's Wharf, et al. $350,000

Four fishing boats, pier, fish market, five apartments. An explosion aboard a 65-ft.-long fishing boat tied up to the pier was the reported cause of fire that destroyed the four boats, the pier, and five adjoining waterfront buildings occupied by a fish market and apartments. Explosion of drums of oil and gasoline stored on the wharf and on boats hampered efforts of fire fighters to check spread of flames.

Race Track Stable

Sept. 11, Stickney, Ill. Est. of T. Carey, et a (Hawthorne Race Track) $290,000.

Race track stable. Twenty-nine horse were killed when fire raced through the story building in which they were stable The entire building was involved when fir men arrived and adjacent stables were i danger of being ignited. There were no fi divisions in the 251 ft. by 66 ft. building no sprinkler protection was provided an construction throughout was combustible This fire was the third in eight years at th track in which horses had been killed. De spite the experience and the obvious fire safety weaknesses a state racing officia stated, "The tracks do everything possible t prevent fires. It is a constant nightmare."

Foam Sprinklers in USAF Hangar

By Joseph K. Schmidt
Command Fire Prevention Engineer
USAF Air Proving Ground Command

Progress in military aviation has led to the development of supersonic aircraft capable of flying intercontinental missions and valued at millions of dollars each. Some of these aircraft carry as much as 32,000 gallons of aviation fuel.

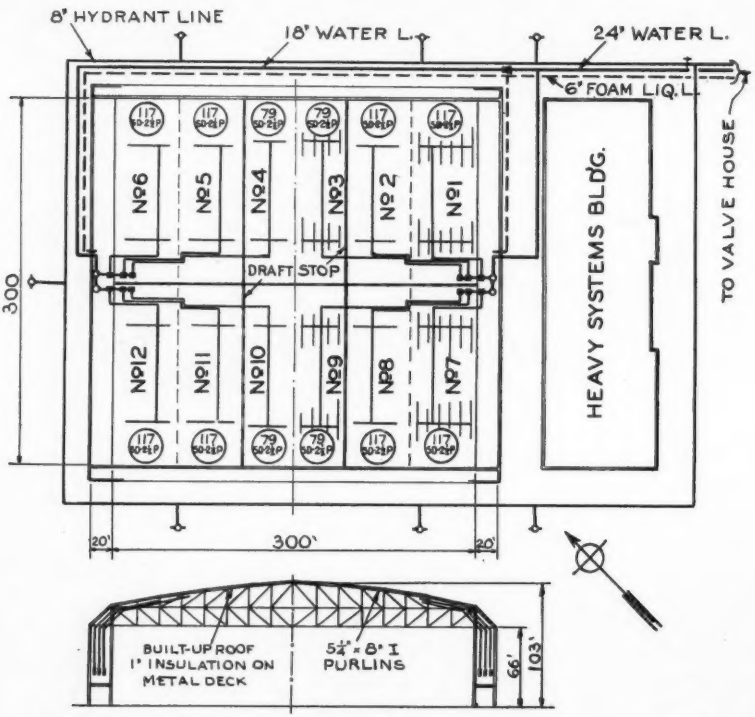
The Air Proving Ground Command has special reasons for desiring to protect these aircraft in their "Installations Building" where experimental models are stored and maintained. If the fuel in one of these aircraft should be spilled, it would cover to a depth of one-half inch the entire hangar floor. The Command undertook an evaluation of the most effective fixed fire protection to cope with this fire hazard.

By study of the NFPA "Analysis of Aircraft Hangar Fire Experience,"[1] there was clear evidence that aircraft lost in hangar fires were valued at 2½ times the loss to buildings. Since present aircraft values were far greater than ever before and since loss of prototype models (sent to the Air Proving Ground Command for operational tests) would hold up production of aircraft for defense, the protection of *individual* aircraft was considered to be the prime objective.

Aircraft fire fighting experience, as accumulated in aircraft crashes and flight

[1] NFPA Hangar Memo AH-4, $5.00 per copy, available from NFPA Publications Service Department.

Hangar at Elgin Air Force Base where air foam sprinkler system has been installed. The building has a floor area of 90,000 square feet and is 104 feet to top of arch. Prototype models of Air Force aircraft are frequently "hangared" in this structure and the protection is designed around saving individual aircraft by automatic fixed foam discharge from 1252 air foam sprinklers.



Layout of twelve air foam sprinkler systems in hangar at Elgin Air Force Base. "SD-2½P" indicates type designation of manufacturer for foam-water sprinkler installed in upright position on distribution piping. This sprinkler is approved by Underwriters' Laboratories as a foam head and as an open sprinkler (for "water only" distribution).

line fires, has shown that water alone does not secure the desired degree of suppression in the critical time element allowed before extensive aircraft damage may occur. The application of mechanical foam has proved to be the most practical and effective medium of aircraft fire suppression of any *single* extinguishing agent now available. It must be remembered that in the above situations, relatively small amounts of agent are available and the application is largely manual. In automatic, fixed fire protection systems in hangars, the need for foam to supplement the cooling effects of water has not been firmly established. By installing a foam-water sprinkler system in this hangar we are attempting to secure the benefits of the use of foam on aircraft fires and we are complying with the established USAF policy of providing deluge sprinkler protection. Such a system is recognized in the 1954 NFPA Standards on Aircraft Hangars (NFPA No. 409),[2] Chapter 16, and this article reports one of the first actual installations.

[2] Available from NFPA Publications Service Department, 50 cents per copy.

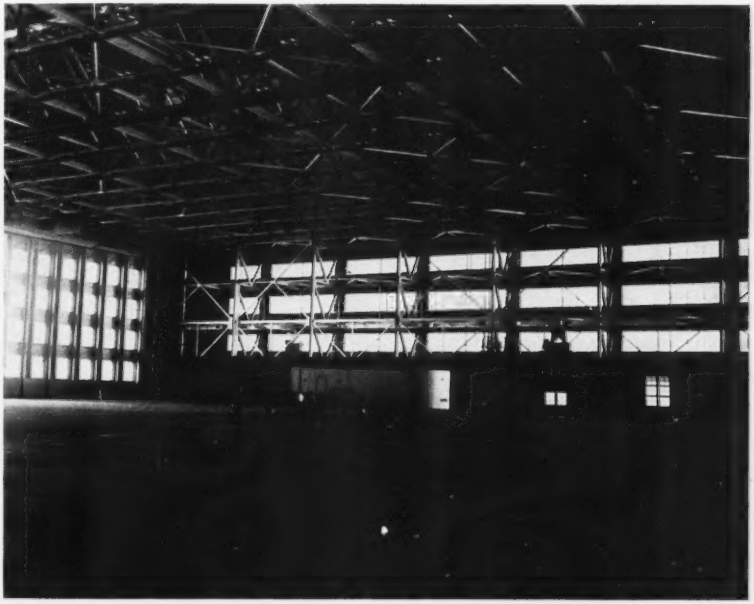
It was found that systems using this principle had been installed in chemical plants,[3] that tests had been conducted using foam discharge equipment from heights of 35 feet[4] and that the Underwriters' Laboratories, Inc. listed foam-water sprinklers suitable for this type of service.[5] However, there were not available at the time the decision had to be made, any precise standards covering the type of installation required in this 104-foot-high structure. Because of the soundness of the principles involved, the Air Proving Ground Command secured approval to purchase an engineered, mechanical foam-water sprinkler system for the proposed structure.

Between September 18 and 22, 1954, final tests of the protection installed were completed. The systems were accepted as satisfactory and in accordance with the NFPA Standards on Aircraft Hangars and the September 1954 "Standard of the National Board of Fire Underwriters for Combined Foam and Water Spray Sys-

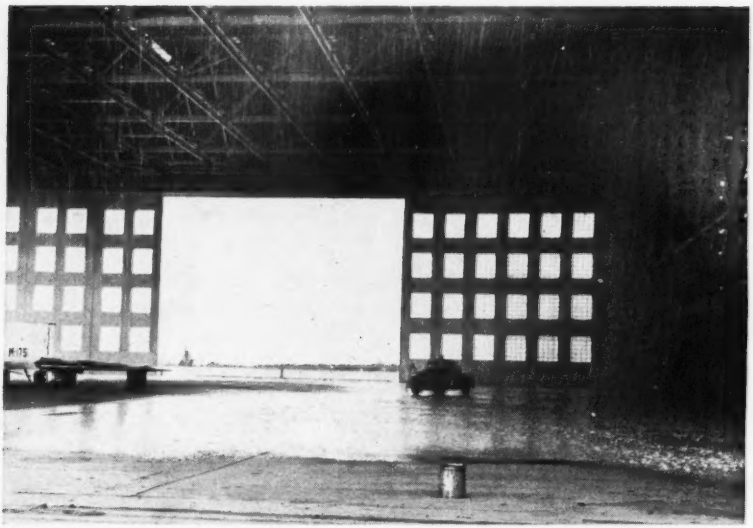
[3] See NFPA Quarterly, April 1949, "A Novel Foam System" or pamphlet by the same title available for 25 cents per copy.

[4] See NFPA Aviation Bulletin No. 25-A, dated November 1949, available from the Association for 50 cents per copy.

[5] See "Fire Protection Equipment List," published by the Underwriters' Laboratories and available from them at 207 East Ohio St., Chicago, Ill.



Interior view of 300-foot-square hangar showing exposed steel roof supports. The roof deck is metal with one-inch insulation and a built-up roof covering. Building walls above the mezzanine are metal and glass. The purlins are 8-inch steel girders, 9 feet 3 inches on center on both sides of a 75-foot center section where the purlins are 6 feet, 2½ inches on center.



Official Air Force Photo, Elgin A.F.B.

Start of test described in this article. Note mock-up aircraft with trailer on left side. There are eight air foam sprinkler systems having 117 sprinklers each and four having 79 sprinklers each. One draft curtain runs east and west in the center of the building parallel to the doors and two north and south, framing a center high section. Foam is flowed under the aircraft mock-up as is desired to extinguish a spill fire.

tems."[6] The tests were witnessed by Air Force personnel, insurance underwriters and manufacturers' representatives. Most of the photographs included in this article were taken during these tests.

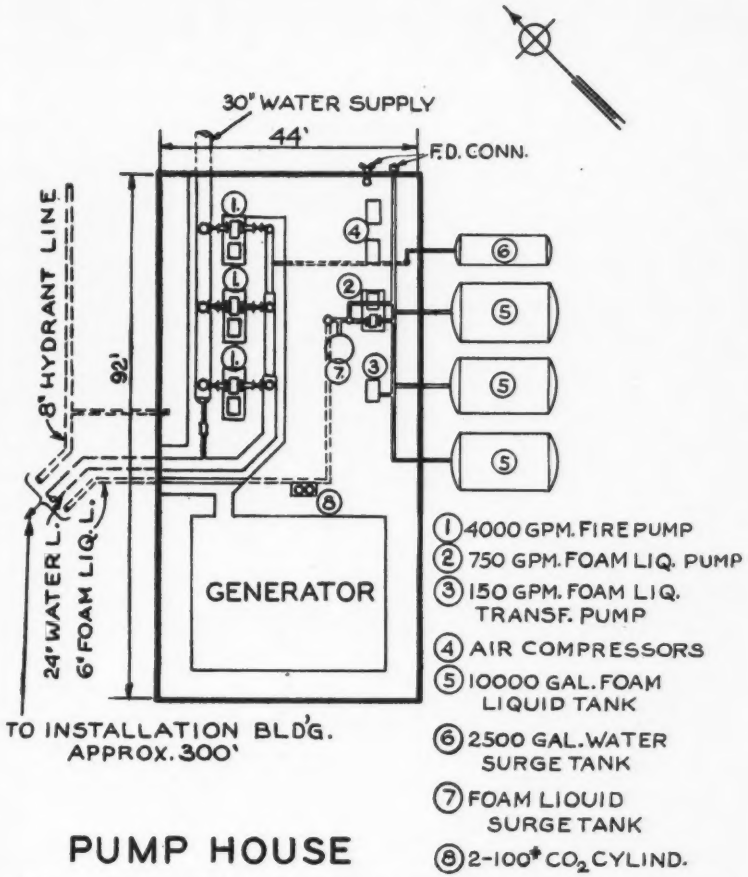
Building Details

The hangar structure is 300 feet by 300 feet, 104 feet high at top of arch and 65 feet, 9 inches at the bottom. The roof has 8-inch steel, unprotected purlins, 9 feet, 3 inches on center (6 feet, 2½ inches on center in 75-foot center section) on 10-inch steel, unprotected "I-beams" spaced 18 feet, 9 inches on center framed into trusses 37 feet, 6 inches on center parallel with the doors at north and south ends. The roof is metal deck with one-inch insulation and with a built-up roof covering. The building walls are noncombustible with unprotected metal walls above the mezzanine. The pump house for the fire protection system is located approximately 350 feet from the hangar structure and is of fire-resistive construction.

Foam-Water Sprinkler System

The fire protection system consists of twelve supervised foam-water deluge systems, with foam-water sprinklers in place of conventional sprinklers. Eight of the systems have 117 sprinklers each; four have 79 sprinklers each; a total of 1252 sprinklers. There is one draft curtain running east to west at the center of the building parallel with the doors and two draft curtains running north and south,

[6] Available from the NBFU, 85 John St., New York 38, N. Y.



The pump house at Elgin Air Force Base is approximately 300 feet from the hangar and is of fire-resistive construction. Note three foam liquid supply tanks (each 10,000-gallon capacity) and accessory foam pumps, surge tank and liquid supply line.

framing the center high section. The foam-water sprinklers are spaced 7 feet, 6 inches on center on main lines and 9 feet, 4½ inches on center on branch lines. This spacing provides floor coverage of 70.3 square feet per sprinkler. The design calls for approximately 0.17 gallons per minute per square foot of floor area of foam-water solution (unexpanded). The calculated density of water (only) per square foot of floor area is 0.15 gallons per minute.

The protection is operable as a standard water deluge system in accordance with NFPA Standard No. 409 and NFPA No. 13 or as a foam deluge system with Underwriters' Laboratories approved components. The foam liquid is introduced into the riser above the deluge valve. There are twelve six-inch deluge

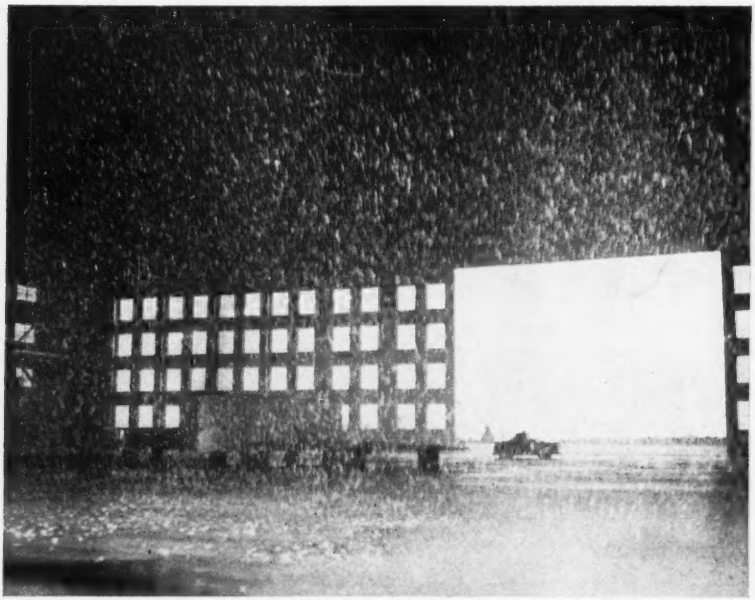
valves controlling the water supply and twelve two-and-a-half-inch deluge valves controlling the foam liquid supply. The foam liquid is proportioned in approximately a 6 per cent ratio through orifice plates at each riser connection.

Water and Foam Supply

The water supply is from three 4,000 gallon per minute fire pumps taking suction from a 600,000-gallon reservoir. The water supply available permits operation of the system for a period of at least 45 minutes with all systems operating in compliance with NFPA No. 409, Paragraph 1513. b. (8). The foam liquid is supplied by a 750 gallon per minute centrifugal pump taking suction from a 10,000-gallon foam liquid storage tank. Two additional 10,000-gallon foam liquid tanks are in reserve to be tapped manually if required. Underground piping from the pump house to the hangar is monocast and enamel lined for both water and foam liquid supply. Valve headers are controlled by supervised post indicator valves, 5 feet outside the building.

Auxiliary Equipment

Supplementary to the overhead foam-water sprinklers are eight hose stations, four on either side of the hangar, for manual operation with either foam or water, also installed in accordance with NFPA Standard No. 409.



Air foam sprinklers in full operation produced this "snowstorm" effect. Each sprinkler is designed to cover 70.3 square feet of floor area with a discharge of approximately 0.17 gallons per minute per square foot of floor area of foam-water solution. Tests showed a foam expansion of 9 per cent on the floor. The installed system meets NFPA Standards No. 409 and No. 13.

Official Air Force Photo, Elgin A.F.B.

After the foam was discharged from all systems for three minutes, a five minute pause was permitted to examine the quality of the foam blanket. Then the systems were operated for five more minutes using water only to simulate what might happen if the foam liquid supply was exhausted. The photo shows how well the foam blanket stood up after this "water only" discharge was completed.

Located in the pump house is a 1,000 kilowatt Diesel generator that will operate automatically on loss of usual power. This generator is capable of providing full operating power for the fire and foam liquid pumps.

Foam-Water Sprinkler Tests

In addition to satisfactory standard deluge sprinkler tests using plain water through the special foam-water sprinklers, two full scale tests were made with the foam liquid introduced into the system. The first foam-water sprinkler tests were made to evaluate and determine the correctness of the hydraulic design and the rate of foam discharge. The second foam-water test was a full scale discharge of all twelve systems in the hangar, during which these photographs were taken.

The mechanical foam liquid used was a standard six per cent solution with the foam liquid complying with Joint Army-Navy Specification C-266 (Type 5). The pressure at the sprinklers was kept above the 20 pounds per square inch minimum specified in the Underwriters' Laboratories, Inc. listing of the equipment. The actual pressures at the sprinklers varied from 59 pounds per square inch with one system operating to 27 pounds per square inch with 12 systems operating. Six systems were first operated additively (pressure readings being taken after each of the

systems was added) and then the six additional systems were manually operated.

Foam injection rates with one system discharging were calculated at 6.05 per cent (refractometer readings: 5.8 per cent) while with the twelve systems operating, the foam injection was calculated as varying between 5.4 and 6.0 per cent (refractometer readings indicating a fairly constant 5.9 per cent). Tests of the foam discharged on the floor showed an expansion of 9 per cent while tests at the sprinkler indicated an expansion rate of 6. Apparently, therefore, the 104-ft. drop improved the foam expansion rate.

During the full scale test, foam was discharged for over 15 minutes to allow accurate measurements. More than 5,000 gallons of foam liquid were used during the test. In the final test, the first system was operated by application of heat to a heat actuating device while the other systems were operated manually at five second intervals until all 12 were in service. The systems were allowed to operate for three minutes and stopped so that the foam blanket could be examined. Five minutes were allowed for examination of the foam blanket and then the systems were turned on for five more minutes using water only to simulate what might happen if the foam liquid supply was exhausted. The application of water for this period appeared to have improved rather than to have deteriorated the quality of the foam blanket.

It is the writer's impression that this foam-water sprinkler system opens a new era in fixed protection for this type of hazard and he wishes to give the contractor responsible for the installation ("Automatic" Sprinkler Corporation of America) a vote of thanks for engineering the design.

Industrial Organization for Fire Safety

By Alan L. Kling, Assistant Director
Safety and Loss Prevention Department
American Cyanamid Company

In considering industrial fire losses, it is recognized that industrial technology has changed vastly over a relatively short span of years. Processes have increased in their complexity, new products and new hazards are continually appearing, and there are frequent changes in operating procedures and personnel.

It might seem that the development of protective equipment and fire safety standards has lagged, that industry has created hazards and unsafe operations faster than it determined methods for controlling them. A comprehensive review of industrial fires and the analysis of their causes indicate that in most cases adequate protective means were available, but either they were not used or they failed to function properly when needed.

Broad fire safety programs which include all phases of industrial activity from initial building and process design through construction to the final daily operation of the plant will greatly improve the present fire loss record.

Management Attitude Primary

Such a program of industrial fire safety has its first expression in the attitude of plant management. Whether it is the owner himself or an administrative team responsible to a large number of stockholders, the interest and concern which they manifest in fire prevention and protection will be expressed at every supervisory level and in the attitude of every employee.

It is not sufficient to merely wish for a fire-safe plant; there must be continuous, sustained interest and support. This does not necessarily mean unquestioned approval of all fire fighting equipment requisitioned by the Fire Chief; it does not mean immediate action on every request of the plant fire protection engineer; nor does it mean complete agreement with every insurance company recommendation. All proposals which involve the expenditure of company funds must be evaluated in terms of the over-all, long-range plans of the organization. Reduced to its simplest terms, management support consists of four things:

1. Insistence that all fire hazards be identified;

2. Acceptance of the fact that there is a definite relationship between the number of fires and the preventive efforts expended;

3. Realization that the amount of loss and the protection provided are also directly related; and

4. Reduction of the maximum probable loss to the lowest acceptable amount.

Although the basic principles and fundamental practices of sound fire prevention and protection are the same,

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FIRE BRIGADE DRILL REPORT

LOCATION	DATE
TIME OF SIGNAL	TIME OF RESPONSE
BOX NUMBER	LOCATION
PUMP NUMBER	TIME STARTED / DISCHARGE PRESSURE

FIRE FIGHTING PROBLEM OR SUBJECT OF DRILL

LIST OF EQUIPMENT USED

NUMBER OF HOSE LINES LAID 1-1/2" 2-1/2"	WAS WATER USED? ☐ YES ☐ NO

DID EQUIPMENT WORK PROPERLY? (EXPLAIN IN DETAIL ALL DEFECTS OR FAULTY OPERATION)

DESCRIBE INSTRUCTION GIVEN AT THIS DRILL

LENGTH OF DRILL	NUMBER FIREMAN PRESENT
REVIEWED BY	REPORTED BY

American Cyanamid Fire Brigade Drill Report.

regardless of the products manufactured, it is impossible to take a program from one plant and superimpose it on another with any degree of success. Each plant has widely different problems and each plant must have a tailor-made program designed to fit its own needs and conditions.

Fire Safety Starts in Laboratory

In considering a fire safety organization, the first question that arises is,

ROUTE TO

AMERICAN Cyanamid COMPANY
AND SUBSIDIARIES

FIRE AND DAMAGE REPORT
(INCLUDING EXPLOSIONS, LIGHTNING, BOILER AND MACHINERY, ETC.)

PLANT _____ DATE OF REPORT _____

DATE OF OCCURRENCE _____ TIME REPORTED: _____ ☐ AM ☐ PM

LOCATION: BLDG. _____ FLOOR _____ DEPT. _____ SUPERVISOR _____

ALARM BOX NO. _____ OR OTHER NOTIFICATION USED _____

DISCOVERED BY _____ REPORTED BY _____

TIME FIRE ALARM SOUNDED _____ TIME FIRE EXTINGUISHED _____

NUMBER OF PLANT FIRE BRIGADE MEMBERS ENGAGED _____

OUTSIDE ASSISTANCE _____

DESCRIPTION OF OCCURRENCE _____

REPORTED TO: FIA ☐ HARTFORD STEAM BOILER ☐ OFFICE _____ DATE _____

CAUSE _____

PREVENTIVE MEASURES TO BE TAKEN _____

FIRE EXTINGUISHMENT EQUIPMENT USED _____

NUMBER OF SPRINKLER HEADS OPENED _____ TIME SPRINKLER PROTECTION RESTORED _____

DESCRIBE ANY FAILURE OF FIRE PROTECTIVE EQUIPMENT _____

HAS ALL FIRE PROTECTIVE EQUIPMENT BEEN RESTORED FOR IMMEDIATE USE? _____

INJURIES TO PERSONNEL _____

SIGNED _____
TITLE

90F-3483 PTD. IN U.S.A. 7/52

(Use Reverse Side for Preliminary Loss Report)

Every fire has an important lesson and American Cyanamid requires a report on every incident on this form. The supervisor of the department having the fire should make a separate or joint report with the plant Fire Chief to show the nature of the man, material or machine responsible for the fire. (See Page 338 for opposite side of the form).

just where does fire prevention and protection actually start. In American Cyanamid we consider that it has its origin at the laboratory bench and in the pilot plant. It is here that the research chemist and the development engineer can determine properties of the materials being handled and the safe operating limits of processes. It is not too early to think about fire safety when a product is merely a gleam in the eye of a research chemist or a process is still on an engineer's slide rule.

The preparation of flow sheets provides an opportunity for early joint discussion between fire and safety specialists and the research and development technicians. These can be simple or elaborate drawings depending upon existing conditions. Both the broad principles of fire safety as well as specific details can profitably be discussed. It is possible to point out inherent hazards in the materials being processed, propose safer substitutes, or suggest the investigation of other methods of accomplishing the same end product.

The design engineer and the draftsman take the data provided by the research chemist and the development

PRELIMINARY LOSS REPORT

(NOTE: Do Not Hold Up Report For Detailed Loss Data. Include Best Estimates and Forward Report Within 24 Hours)

DESCRIBE DAMAGE TO:

BUILDING _____

_____ EST. LOSS $ _____

EQUIPMENT _____

_____ EST. LOSS $ _____

PRODUCT _____

_____ EST. LOSS $ _____

ESTIMATE OF TOTAL PROPERTY LOSS $ _____

ESTIMATE OF QUANTITY OF PRODUCTION LOST _____

ESTIMATE OF USE & OCCUPANY LOSS IN DOLLARS $ _____

ESTIMATES BY _____ DATE _____

REVIEWED BY _____ DATE _____

IMPORTANT: This is a Preliminary Loss Report only. Follow with detailed loss data as developed

Opposite Side of Fire and Damage Report.

engineer and expand them many times to obtain a production unit. In addition to the safe limits already established, the final design also should be based on accepted codes and standards. In multiplant operations it is desirable to have company standards to ensure uniformity between all installations. During the actual engineering, fire and safety specialists should follow closely the progress and when drawings as well as specifications are nearing completion, there should be a final review to make certain that all potential hazards are recognized and that adequate fire protection has been provided. Where there is a central staff office charged with the responsibility of fire safety, their approval should be obtained. At this point, it is also desirable to consult the insurance underwriters, and it is common practice to have a final review meeting attended by insurance representatives, project engineers, operating personnel, and fire and safety specialists.

Construction Fire Regulations

When construction begins, there should be a definite understanding with the contractor that he will observe the company's fire and safety regulations. The only satisfactory time of advising a contractor of the limitations which will be imposed on his work is *before* he submits his bid. In the formal contract itself, there should be a general statement requiring the contractor to comply with all company fire and safety rules. In addition there should be prepared a detailed description of the limitations of the job, so that there will be no question in the contractor's mind as to what is expected of him.

In some plants it is possible to prepare a general set of procedures that must be followed. In most cases, however, it is necessary to outline hazards and requirements for each individual job. If this list is specific, if the contractor is well aware of its significance before he bids, and if it is reviewed again in detail with him before the work starts, there will usually be little difficulty in obtaining the contractor's cooperation. Reputable contracting firms are interested in future jobs, and they know that if their work is not satisfactory, if they have trouble with the Fire Chief and the safety supervisor, the possibility of obtaining additional contracts is greatly reduced.

Process Fire Precautions

After a plant has been constructed or a new process started, it is essential that detailed operating instructions be prepared before the actual start-up. These instructions should contain a description of the hazards involved and all of the fire and safety precautions that are necessary. Personnel should be thoroughly familiar with the operating procedures and, in addition, they should appreciate their importance. These procedures need frequent review by qualified operating supervision and technical specialists to make certain that conditions have not changed and that dangerous short cuts have not been introduced. Above all, there must be appreciation of their significance and importance.

Along with operating procedures, there must be continual instruction of plant personnel in fire prevention and protection. This can be done through formalized training courses, by periodic

GOK-1419 REV. 4-54 4/54

WEEKLY INSPECTION OF FIRE PROTECTIVE EQUIPMENT

AMERICAN Cyanamid COMPANY

LOCATION

DATE OF INSPECTION

MAIN AND DIVISIONAL VALVES

VALVE NO.	CONTROLS	ANSWER BY WRITING YES OR NO: OPEN	SHUT	SEAL'D	VALVE NO.	CONTROLS	ANSWER BY WRITING YES OR NO: OPEN	SHUT	SEAL'D	VALVE NO.	CONTROLS	ANSWER BY WRITING YES OR NO: OPEN	SHUT	SEAL'D

SPRINKLER CONTROL VALVES

VALVE NO.	CONTROLS	ANSWER BY WRITING YES OR NO: OPEN	SHUT	SEAL'D	VALVE NO.	CONTROLS	ANSWER BY WRITING YES OR NO: OPEN	SHUT	SEAL'D	VALVE NO.	CONTROLS	ANSWER BY WRITING YES OR NO: OPEN	SHUT	SEAL'D

HYDRANTS AND HOSE HOUSES

NUMBER	FEET OF HOSE: 2½"	1½"	NUMBER OF NOZZLES	STANDARD EQUIPMENT ACC'T. FOR YES OR NO	NUMBER	FEET OF HOSE: 2½"	1½"	NUMBER OF NOZZLES	STANDARD EQUIPMENT ACC'T. FOR YES OR NO	NUMBER	FEET OF HOSE: 2½"	1½"	NUMBER OF NOZZLES	STANDARD EQUIPMENT ACC'T. FOR YES OR NO

HOSE REELS AND STANDPIPES

NUMBER	LOCATION	HOSE: SIZE	AMOUNT	IN GOOD CONDITION? ANSWER YES OR NO	NUMBER	LOCATION	HOSE: SIZE	AMOUNT	IN GOOD CONDITION? ANSWER YES OR NO
					HOSE CARTS				

TANKS AND RESERVOIRS

TYPE - LOCATION	CAPACITY	WATER LEVEL: FULL YES OR NO	GAUGE READING	TEMP.	REMARKS

FIRE PUMPS

PUMP NUMBER	LOCATION	RATED: G.P.M.	HEAD	TIME: START	STOP	PRESSURE DEVELOPED IN POUNDS	SPEED R.P.M.	REMARKS

ANSWER ALL QUESTIONS ON REVERSE SIDE -

REVIEWED BY _____ INSPECTOR _____

American Cyanamid Weekly Inspection Form.

releases to all employees, at safety meetings or by use of the plant bulletin boards.

Brigade and Fire Reports

Each plant should have a well organized Fire Brigade which holds regular drills. These must be carefully planned so that proficiency in the handling of the equipment can be developed as well as a knowledge of the types of fires which might be encountered. Good organization, of course, requires a complete report for each drill.

FIRE SAFETY OBSERVATIONS

(Answer all questions with Yes or No)

1. FIRE SERVICE LADDERS – Were all in place and in a safe condition to use? _____

2. OPEN FLAMES – Were all regulations regarding the use of open flames, including electric welding, being observed? _____

3. PORTABLE FIRE EXTINGUISHERS – Were any fire extinguishers out of place or being misused? (NOTE: A separate inspection check-list for fire extinguishers should be used.) _____

4. FIRE DOORS – Were all fire doors inspected and found in operating condition? _____ Were there any unprotected openings in fire walls observed? _____

5. NEW CONSTRUCTION & ROUTINE MAINTENANCE – Were sufficient fire precautions being taken in these areas? _____

6. SMOKING – Were any violations of smoking regulations seen? _____
Any cigarette butts found in "non-smoking" areas? _____

7. PLANT APPEARANCE – Was general order and neatness good? _____
Were any unnecessary accumulations of combustibles found? _____

8. COMMENTS – (Explain any deficiencies noted above, and describe any other fire hazards observed during this inspection.) _____

Back Side of Weekly Inspection Form.

At American Cyanamid Company, the Safety and Loss-Prevention Department in the New York office receives copies of both drill and inspection reports and prepares a summary each month for top management.

If processes are adequately controlled and if the automatic fire protection, as well as the plant brigade, functions properly, any fires which do occur will usually be small. Nevertheless, it is essential that a complete report be made for every fire regardless of size. Actually, a fire represents a failure of one of the elements of production, namely, man, material or machines, and for that reason the Fire Chief's report should be supplemented by a report of the supervisor in the area involved. He should either take part in a joint investigation or preferably make his own separate investigation. In many of our plants, operating supervisors must add their comments to the formal report of the Fire Chief.

Inspection of Fire Equipment

The installed fire protective devices in a plant are of value only if they are in proper operating condition, and

GOF-2832 8/54

SAFETY WORK PERMIT

AMERICAN Cyanamid COMPANY

ISSUED TO	NAMES OR BADGE NUMBERS COVERED	

FOR: ALL WORK DONE BY PLANT FORCES OR CONTRACTORS, INVOLVING:

1. Hot work – any open flame, such as welding, cutting or lead burning, and use of portable spark or heat producing equipment.
2. Entering vessels, tanks, pits or confined areas.
3. All work requiring special precautions to ensure personnel safety.

GOOD FOR _____ SHIFT ONLY _____ (DATE) 19 _____

BUILDING _____ AREA _____

DESCRIBE WORK TO BE DONE _____

NOTE: CHECK IN YES OR NO. IF QUESTION DOES NOT APPLY CHECK "DNA"

	YES	NO	DNA
1. Can the job be done outside in a safe area rather than in the building: NOTE: Equipment to be removed from any manufacturing building for repair must be passed by Department Supervisor as free from dangerous material.	☐	☐	☐
2. Have all process materials (solids, liquids, gases) been removed from the equipment?	☐	☐	☐
3. Has vessel and attached piping been drained, cleaned and ventilated?	☐	☐	☐
4. Is mechanical ventilation necessary throughout course of job?	☐	☐	☐
5. Have all lines been disconnected and connections blanked off?	☐	☐	☐
6. Have switches been locked open? (Safety locks on push bottons are not sufficient)	☐	☐	☐
7. Have safety tags been attached?	☐	☐	☐
8. Has gas test been made?	☐	☐	☐
9. Is gas mask, air mask or other respiratory protection necessary?	☐	☐	☐
10. Are there any precautions necessary regarding electrical grounding?	☐	☐	☐
11. Is adjacent equipment safe against this work?	☐	☐	☐
12. Can sparks ignite material in vicinity or on lower floors or levels?	☐	☐	☐
13. Is it safe to do this work?	☐	☐	☐

14. Special precautions taken: _____

I have personally inspected the work site and approve this permit.

TIME _____ AM / PM SIGNED _____ SUPERVISOR

GAS TEST APPROVAL

Combustible Gases: _____

Oxygen Excess or Deficiency: _____

Time of Test: _____ AM / PM

Original to person doing work.
Pink copy to Dept. Supervisor
Blue copy to Safety and Fire Supervisor

SIGNED _____ GAS TESTER

American Cyanamid "Hot Work" Permit Controls Hazard.

to make certain that they always are, it is necessary to have an adequate inspection program. An inspection form or check list is essential. Too often a person charged with the responsibility of checking all fire protective equipment feels that he has an adequate mental check list and that he knows the location of every single piece of equipment. Experience has shown that eventually he will miss one or two items. The inspection report should contain a list of all main and divisional valves, sprinkler control points, hose houses, special extinguishing systems, and all other equipment that is in any way connected with fire fighting operations. Equally as important as listing all of the equipment is having the inspections on a regular schedule.

Hazardous conditions observed during an inspection tour should be reported immediately by phone, and then confirmed in writing. Any kind of simple form would be adequate for this purpose.

Plant Maintenance Fire Hazards

Fires often occur during normal maintenance work. Here safety work permits can be very effective. These should cover the use of open flames, such as welding and lead burning; all abnormal exposures to flammable, corrosive or toxic materials; work under conditions where extreme temperatures might be encountered; and the entering of any confined space, such as a closed vessel, a tank, or pit. Even though entry into a tank might not involve fire, the Fire Chief is usually concerned because if difficulty is encountered, it will generally be his men who perform the rescue operations.

Those jobs which require permits can be indicated on the original maintenance work order. The safe work permit system should be so thoroughly enforced that no individual in a plant would ever consider using an open flame unless the work was properly authorized. Welders, who are probably the chief users of non-fixed open flames in plants, will give excellent co-operation once they understand that if they start a fire with their torches, they themselves are most often the first to be injured.

In addition to general plant fire and safety rules and operating instructions, it is often necessary to have specific rules for certain areas. It has been found that these are especially useful in plants where there is a large turnover of labor, or where it is necessary to assign new men to operating areas in which there are fire and injury possibilities. At one Cyanamid plant, these are framed and located inside of the entrance to the building so that a foreman can readily instruct a maintenance man in necessary safe practices before he starts his work.

There are other important parts to a good fire safety organization — such things as insurance company relationships, emergency procedures, mutual aid plans and Fire Prevention Week activities, to name just a few. But whatever they are, however they are accomplished, the goal is always the same — effective control of fire and conservation of our economic resources.

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McKESSON & ROBBINS, INCORPORATED,
protects its 90 distribution centers
***Automatically*... gets better FIRE and**
BURGLARY protection and...

a total saving of $630,000 annually!

Coast to coast, McKesson & Robbins, Incorporated, manufacturers and distributors of pharmaceutical products, guards its distribution centers against fire, burglary and other hazards by combinations of ADT Automatic Protection Services.

Analysis of costs shows an average saving of $7,000 a center over the cost of protection by other less effective methods —a total saving of $630,000 annually. McKesson officials find that along with this saving ADT Services give them greater security for their property, profits, and employees' jobs.

ADT Electric Protection Services guard every type of building, new or old, sprinklered or unsprinklered. The appropriate ADT Fire Alarm Service will detect fire and notify the fire department *automatically*. ADT Burglar Alarm Service will *automatically* summon police when burglars attack. ADT Heating and Industrial Process Supervision will *automatically* detect and report other abnormal conditions.

An ADT specialist will show you how combinations of these automatic services can protect *your* property. Call our Commercial Department if we are listed in your phone book; or write to our Executive Offices.

ADT

Controlled Companies of
AMERICAN DISTRICT TELEGRAPH COMPANY
A NATIONWIDE ORGANIZATION
Executive Offices
155 Sixth Avenue, New York 13, N. Y.

DETECT-A-FIRE®

Rate Compensation Actuated THERMOSTATS insure positive Fire Detection for alarm or release systems

Fenwal DETECT-A-FIRE units are based on an entirely new principle. The outer shell is the sensing element — reacting to the temperature of the air around it. The contacts function when surrounding air reaches a danger level.

- *Hermetic Sealing* of internal electrical components.
- *Stainless Steel Construction* — for corrosion resistance and long life.
- *Temperature Setting Range*, 140 F to 725 F.
- *Long Spacing* . . . 25 feet . . . economy of installation.
- *Repeatable.* Unit re-sets itself, nothing to replace.
- *Shock and Vibration Resistant* . . . rugged construction.

SERIES 70 HORIZONTAL MODEL.

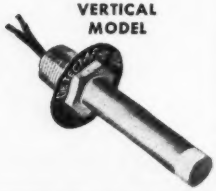
For locations where appearance is a factor. Suitable for all commercial, industrial, mercantile and public buildings, institutions and ships, in locations classified as "ordinary" under the National Electric Code.

TYPES 7020 and 7021

Flush Mounting Unit for new construction and concealed wiring. Type 7020, normally closed circuits; Type 7021, normally open circuits. Designed to fit standard 4" junction boxes. For exposed wiring, Types 7020-1 and 7021-1 with surface adapter ring.

LISTING and APPROVALS: Ⓤ, ⟨FM⟩, USCG, and American Bureau of Shipping Acceptance.

SERIES 71 VERTICAL MODEL



For ordinary and hazardous locations i.e., Class I, Groups C and D; Class II, Groups E, F, and G. Explosion-proof in itself. For hazardous locations, mount to Crouse Hinds CPS 021 Cover or Appleton BFGS Hub Cover for explosion-proof system.

TYPES 7120 and 7121

For concealed and exposed wiring. Type 7120, normally closed circuits. Type 7121, normally open circuits.

LISTING and APPROVALS: Ⓤ, ⟨FM⟩, and American Bureau of Shipping Acceptance.

SEND FOR THESE BULLETINS.

They give the latest authoritative data on fire or overheat detection. They discuss in full the rate compensation principle; give exact engineering data. Write for Bulletins MC-107A and MC-108 to Fenwal Incorporated, 141 Pleasant Street, Ashland, Mass.

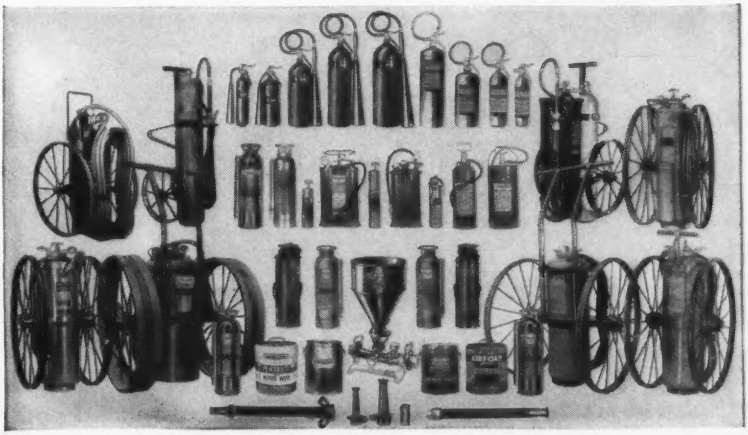
Fenwal

DETECT-A-FIRE® Thermostats

DYNAMIC, RATE COMPENSATION ACTUATED FIRE DETECTORS

AMERICAN-LAFRANCE

FINEST FIRE-FIGHTING EQUIPMENT



Fire Extinguishers: Foamite, Soda-Acid, Anti-Freeze, all Water Types, Carbon Dioxide, Dry Chemical and Vaporizing Liquid.

Wheeled Engines: Foamite, Soda-Acid, Anti-Freeze, Carbon Dioxide and Dry Chemical.

Fire Extinguishing Systems: Foamite Single Powder, Alcofoam Single Powder, Foamite Dual Powder, Foamite Two Solution, Foamite Airfoam, and Carbon Dioxide.

Fire Hose: Allweather Fire Hose, white and clean, flexible for easy racking, strong and durable, seamless tubing, smooth waterways, double jackets tailored to fit, flat-cured. Wide range of selection.

Fire-Fighting Supplies: Every need of the fire service can be promptly supplied from our complete stock of the most modern equipment.

American-LaFrance industrial fire extinguishers are approved by either the Underwriters' Laboratories, Inc. or the Factory Mutuals Laboratories, or both.

AMERICAN-LAFRANCE-FOAMITE Corporation

ELMIRA-NEW YORK-U.S.A.

In Canada, LaFrance Fire Engine & Foamite Ltd., Toronto

These photos dramatically show protection afforded by Akbar Door in recent fire.

AKBAR
Rolling Fire Doors Made Only By KINNEAR

More Safety Features

Kinnear Akbar Fire Doors provide fast, positive fire protection at doorways and other wall openings.

Doors are automatically pushed downward when fire threatens. A strong spring provides positive action. Downward speed is controlled to insure safety for building occupants . . . and the doors can be opened easily for emergency exits. They automatically close again at once.

Another Akbar safety feature stops the door at sill level, even if the floor is burned away. A special locking device prevents the curtain from coming off the spool.

When not in use, Akbar Doors coil out of the way over the lintel. Approved and labeled by Underwriters' Laboratories, Akbar Doors can save as much as one third of their cost per year in reduced insurance rates!

Each Akbar Door is engineered for the specific opening, insuring the ultimate in closure.

Akbar Fire Doors can be equipped for daily use with motor or manual operation if desired. Where maximum fire protection is not required, non-labeled Kinnear Rolling Doors are recommended.

LARGE SIZES: Kinnear makes doors for firewall openings ranging up to many hundred square feet in area. These large doors are built with the same safety and protective features offered in the labeled doors described above.

Write for details!

SAVING WAYS for DOORWAYS

KINNEAR ROLLING DOORS

THE KINNEAR MANUFACTURING CO.

FACTORIES:
2250-70 Fields Ave., Columbus 16, Ohio
1742 Yosemite Ave., San Francisco 24, Cal.
Offices and Agents in All Principal Cities

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UPRIGHT
MODEL SSU

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FIRE SPRINKLER SYSTEMS AND EQUIPMENT

Engineered for better protection

ALARM VALVES
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TRIMMINGS

Manufactured and Installed by

GRIMES DEVICES
ARE APPROVED BY
ALL INSURANCE
INTERESTS

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SPRINKLER DIVISION

RAISLER CORPORATION, 129 Amsterdam Ave., New York 23
Licensees in all principal cities in the United States and Canada

HORTON WATERSPHERE

Protects Rubatex Division Plant From Fire

To provide a reliable secondary source of water supply for their sprinkler system Rubatex Division of Great American Industries, Inc., installed this 100,000-gallon Horton Watersphere at their Bedford, Virginia, plant. The Bedford distribution system serves as the primary source of water supply for the plant.

The five buildings of the Rubatex plant contain approximately 130,700 square feet of floor area and are protected by 1,480 sprinkler heads. Rubatex' Bedford plant manufactures Hardboard, a low temperature insulation; sponge rubber rug pads; cellular sponge rubber sheets for the automotive trade and sporting goods industry, and polyvinylchloride sheets and di-isocyanate foam.

Waterspheres are available in standard capacities from 25,000-gallons to 250,000-gallons. In addition ellipsoidal-bottom tanks in capacities from 15,000-gallons to 500,000-gallons, are also available.

CHICAGO BRIDGE & IRON COMPANY

ATLANTA	CHICAGO	LOS ANGELES	SALT LAKE CITY
BIRMINGHAM	DETROIT	NEW YORK	SAN FRANCISCO
BOSTON	HOUSTON	PHILADELPHIA	WASHINGTON
CLEVELAND	SEATTLE	PITTSBURGH	TULSA

Plants at Chicago, Birmingham, Salt Lake City and Greenville, Pa.

LEXSUCO *Engineered Products for the Construction Industry*

Dramatic simultaneous fire test used identical fire intensities. Over 1900° F. fire, **LEXSUCO ROOF CONSTRUCTION** (left) has not added combustible materials to flames, smokes only slightly. Conventional roof construction (right) has fed combustible roofing materials to fire causing it to spread to roof surface.

New Fire-Retardant Roof Design

Uses Koroseal® Flexible Material as Vapor Barrier

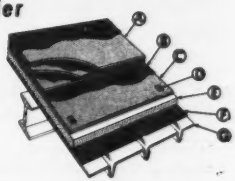
LEXSUCO announces one of the greatest improvements in roof construction . . . a new fire-retardant roof which eliminates hazardous features found in conventional roofs—*at a cost no greater than that of standard roof design.*

LEXSUCO ROOF CONSTRUCTION will prevent "feeding" of combustible materials to fire below the roof. It removes two dangerous conditions: (1) dripping of asphalt into fire area and (2) burning of material between roof deck and insulation.

LEXSUCO ROOF CONSTRUCTION incorporates a single-thickness Koroseal vapor barrier instead of the conventional two-ply barrier of asphalt-saturated felt mopped with asphalt. The Koroseal is a specially compounded, fire-retardant film, easily installed and lap-sealed with LEXSUCO Adhesive to provide a superior vapor barrier. Insulation and the Koroseal barrier are secured to any type deck with either LEXSUCO Insulation Clips or LEXSUCO Adhesive. LEXSUCO ROOF CONSTRUCTION employs standard roofing components and techniques and can be used over any roof deck.

Two full-scale tests using actual fire conditions have proved the fire-retarding superiority of LEXSUCO Roofs. For best protection of plant investment, for employee safety and for uninterrupted production, specify LEXSUCO ROOF CONSTRUCTION—it's yours at no extra cost!

For a complete "Technical Report" on the Lexsuco Roof Construction or for further information, write to:
Lexsuco, Incorporated, 4817 Lexington Avenue, Cleveland 3, Ohio.



Lexsuco Roof Construction over Steel Deck
Ⓐ Built-up roof surface
Ⓑ Mopping of bitumen
Ⓒ Two plies of dry felt
Ⓓ Lexsuco Insulation Clips
Ⓔ Insulation
Ⓕ Koroseal Vapor Barrier
Ⓖ Steel Deck

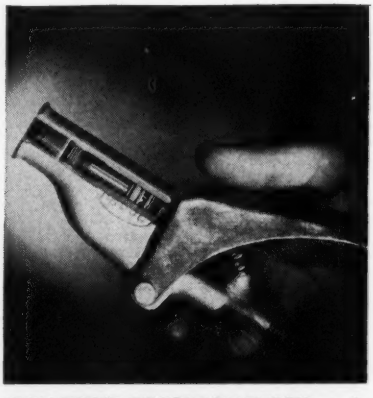
*®T. M. Reg. B. F. Goodrich Co.

See our catalog in Sweet's Architectural and Industrial Construction Files

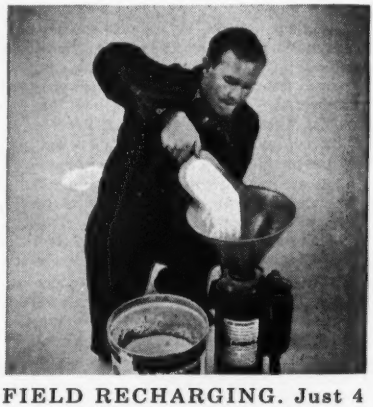
LEXSUCO
INCORPORATED

Here's why Ansul faster, more dependable

READY for instant action under most severe exposure conditions.

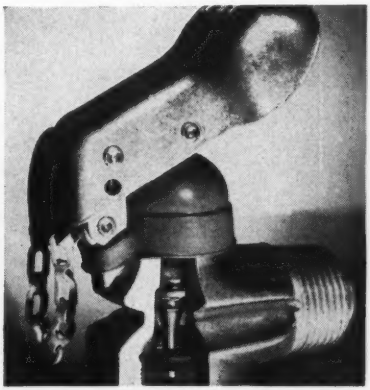


WEATHER-TIGHT NOZZLES made of aluminum and stainless steel, can't rust. Neoprene cap and oil-impregnated washers keep out moisture.



FIELD RECHARGING. Just 4 minutes after a fire is extinguished your Ansul unit can be recharged, ready for action. No special tools are needed.

extinguishers give you fire protection!



PUNCTURE PIN. In this aluminum housing a stainless steel pin pierces the gas cylinder that supplies the propellent power for the dry chemical.

PATENTED NOZZLES. Straight or fan stream, the hazard determines which is installed. An Ansul exclusive for more effective fire control.

The pictures on this page tell half a story. The complete story includes Ansul's facilities for training your personnel in the science of fire control and prevention. Experience has taught us that *complete* fire protection demands *both*—fast, dependable equipment and trained personnel to man that equipment. Ansul can provide both. Get in touch with your local Ansul man, he has the complete story about *complete* fire protection.

Call the ANSUL MAN!

Get in touch with your local Ansul man through the "yellow pages," or write direct to ANSUL CHEMICAL COMPANY, Fire Equipment Division, Dept. F-21, Marinette, Wisconsin.

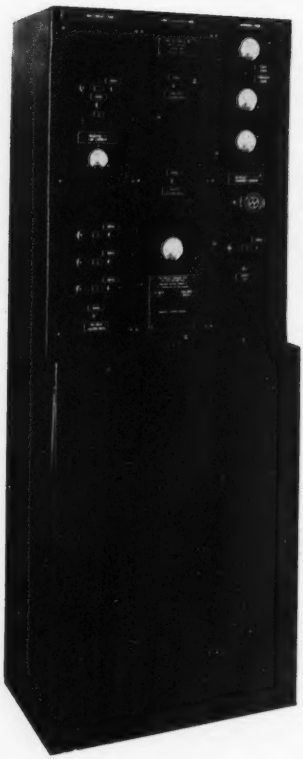
Write Ansul for your copy of New Fire Equipment Catalog.

ANSUL

ACME FIRE ALARM CO., INC.

Type CM and CA McCulloh Central Office Control Units approved by Underwriters' Laboratories, Inc. and Associated Factory Mutual Fire Insurance Companies.

Designed to comply with Federal specification WF 396 A.



TYPE CM

Manually Operated Control Unit

Designed to operate a complete central office shunt McCulloh fire alarm system consisting of fire alarm stations, automatic transmitters, gongs, and register equipment as required.

TYPE CA

Automatically Operated Control Unit

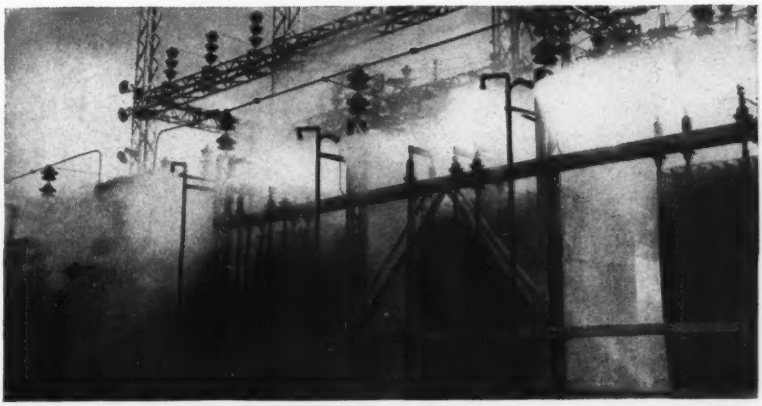
The Acme type CA automatically operated Main Control Unit is identical to the type CM with the exception that all functions of the unit, except the charging, are automatically controlled, making it unnecessary for anyone to operate the system if an open or ground fault occurs on the box circuit. The Control Unit will automatically adapt itself to these fault conditions and normal transmission of signals will continue.

ACME FIRE ALARM CO., INC.

106 Seventh Avenue

New York City, N.Y.

Instantaneous WaterFOG Protection Controls Fire Hazards



The Lake Superior District Power Company's switchyard shown above, must have absolutely dependable fire protection for its giant, oil-filled transformers. Hence, the Rockwood WaterFOG System which instantaneously releases millions of particles of cooling, heat-absorbent water that choke off oxygen and reduce temperature in case of fire.

This same WaterFOG is now available to every type of property through Rockwood WaterFOG Sprinkler Heads that discharge WaterFOG from conventional sprinkler systems. Insurance authorities give these heads a 30% increased fire coverage over ordinary heads. Be sure to specify them for safe—and speedy—fire protection.

Plan now to get your free copy of Rockwood's illustrated booklet "From Navy Fire Fighting to Better Sprinklers." Find out how gas and flames are prevented from mushrooming and needlessly opening adjacent heads. Learn how a cooling wall separates gas and flames from ceiling —how less water is used, fire-and-water damage reduced, and costly production time saved. Send coupon today.

ROCKWOOD

SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

ROCKWOOD SPRINKLER COMPANY
Fixed Installation Division
241 Harlow Street, Worcester 5, Massachusetts

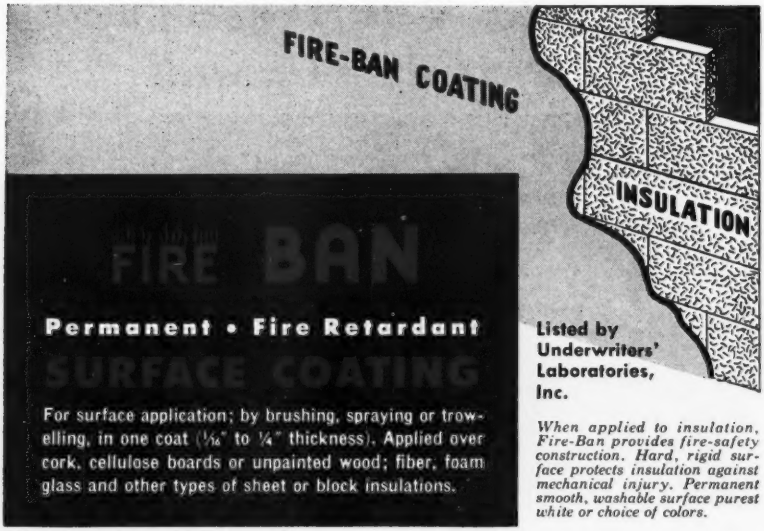
Please send me your illustrated booklet on WaterFOG Sprinkler Fire Protection.

Name.....

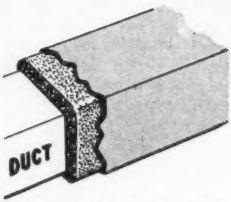
Title.....

Company.....

Street.....City.....Zone.....State.....


FIRE-BAN COATING
INSULATION
FIRE BAN
Permanent • Fire Retardant
SURFACE COATING
For surface application; by brushing, spraying or trowelling, in one coat (1/16" to ¼" thickness). Applied over cork, cellulose boards or unpainted wood; fiber, foam glass and other types of sheet or block insulations.
Listed by Underwriters' Laboratories, Inc.

When applied to insulation, Fire-Ban provides fire-safety construction. Hard, rigid surface protects insulation against mechanical injury. Permanent smooth, washable surface purest white or choice of colors.



When applied to insulation covering ventilating ducts, Fire-Ban not only provides a fire-retardant surface, but a hard, rigid protection against mechanical damage to the insulation. Surface is smooth and cleanable, decreasing accumulation of combustible dusts.

FIRE-BAN is a 100% inert composition that will not burn . . . prevents ready ignition of combustible materials . . . Underwriters' Laboratories, Inc. tunnel test flame spread when applied to Douglas Fir is 20-25.

FIRE-BAN is economical enough for low cost construction. Weighs only 6½ oz. per sq. ft. when applied 1/16" thick. No reinforcement required . . . no surface scoring needed to provide for expansion.

FIRE-BAN provides a monolithic surface that will not curl, blister, check, craze or peel. Not affected by extreme temperature fluctuations, withstands drops to minus 75°F. The surface is non-dusting and non-toxic; does not become tacky when subjected to frequent washings. Thoroughly "field-tested" for over six years.

FREE SAMPLES

Samples of Fire-Ban applied to wood, fiber or cork board, foam glass, Styrofoam, Rubatex and fiber glass supplied upon request. Please specify.

Fire Protection Engineers, Inspectors, Architects, etc., can obtain samples of Fire-Ban with instructions for experimental use . . . no charge or obligation. Write for new Bulletin 54 or outline your problem.

E. H. O'NEILL FLOORS COMPANY

2531 South 50th Ave. Cicero 50, Illinois

REMEMBER...

...there's more to fire protection than just the devices

Many firms manufacture excellent protective devices. In fact, those offered by Blaw-Knox are among the finest. But, more important is the way in which these devices are put together into a fire protection system. Without a system engineered and installed to guard against your particular hazard, the most effective devices are worthless!

Fire is unpredictable. It strikes quickly and when least expected. Be prepared to strike back — with a Blaw-Knox Automatic Fire Protection System.

Blaw-Knox will engineer and install the type of system that will provide you with a maximum of protection, at a minimum of cost. No cash outlay is required, and the system will pay for itself in reduced insurance premiums within a few years. Let a Blaw-Knox Fire Protection Engineer study your needs and submit an estimate . . . absolutely without obligation.

"Little Joey Sprinkler"

BLAW-KNOX FIRE PROTECTION SYSTEMS CARRY APPROVALS OF ALL UNDERWRITERS.

Deluge Systems — Wet Pipe Systems — Dry Pipe Systems — Water Spray and Fog Systems — Rate-of-Rise Sprinkler Systems — Foam and Carbon Dioxide Extinguisher Systems. You'll be interested in the new Blaw-Knox booklet, *"Fire Can Destroy Your Business."* There's no charge. Write for it.

BLAW-KNOX COMPANY

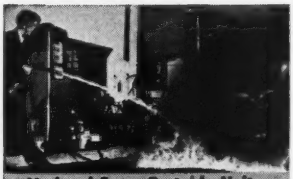
Automatic Sprinkler Department • Pittsburgh 33, Penna.

BLAW-KNOX

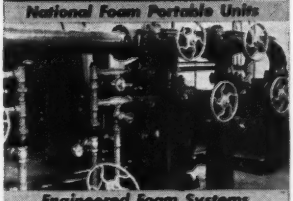
always on the job

Don't Buy Fire Equipment *Piecemeal*

Let Us — **FIRE-ENGINEER**



National Foam Portable Units



Engineered Foam Systems

Complete Line of Foam Products

THE CORRECT SYSTEM FOR YOUR PLANT

You'll save money and risk by calling in National Foam "fire engineers." They survey your plant, analyze every process, location, flammable liquid used, flash points, existing system, water supply, and other factors. They recommend a basic AER-O-FOAM System with manual or automatic control, stationary or mobile operation. They prescribe the proper equipment — Foam Chambers, Overhead Units, Dip-tank Systems, Nozzles, Extinguishers. After installation you reveive a complete operating manual.

Only National offers you *one source* for system design, equipment, and instant, positive, fire-tested AER-O-FOAM. Call on National today to discuss your flammable liquid risks.

Write for new, free booklet, "Foam Fire Protection."

NATIONAL
FOAM SYSTEM INCORPORATED
Headquarters for Foam Fire Protection—WEST CHESTER, PA.

Report on

SHEETROCK* FIRECODE 60

What it is: SHEETROCK Firecode 60 gypsum wallboard is 5/8-inch SHEETROCK with a specially formulated core of gypsum and other incombustible materials. It was developed by U.S.G. to meet rigid code requirements in single layer application for new construction or remodeling.

What it does: SHEETROCK Firecode 60 has received the One-Hour Fire Retardant Classification Label of Underwriters' Laboratories for:

A. Conventional wood stud partitions faced each side with 5/8" SHEETROCK Firecode 60.

B. Conventional wood floor and ceiling constructions with ceiling surfaced with SHEETROCK Firecode 60 Gypsum Wallboard.

C. **New**—Steel joist and concrete Floor Construction, protected with ceiling of SHEETROCK Firecode 60, having either taped or untaped joints; various methods of attaching SHEETROCK Firecode 60 to steel joists.

SHEETROCK Firecode 60 has received a 2-hour Fire Retardant Classification Label of Underwriters' Laboratories for:

Conventional wood stud partitions faced each side with two layers of SHEETROCK Firecode 60 Gypsum Wallboard.

New—Flame Spread rating. A fire hazard classification rating of 10 to 15 is now applicable to this product.

You can recommend and approve SHEETROCK Firecode 60 with full assurance that this product is made to the high quality standards for which U.S.G. products are famous.

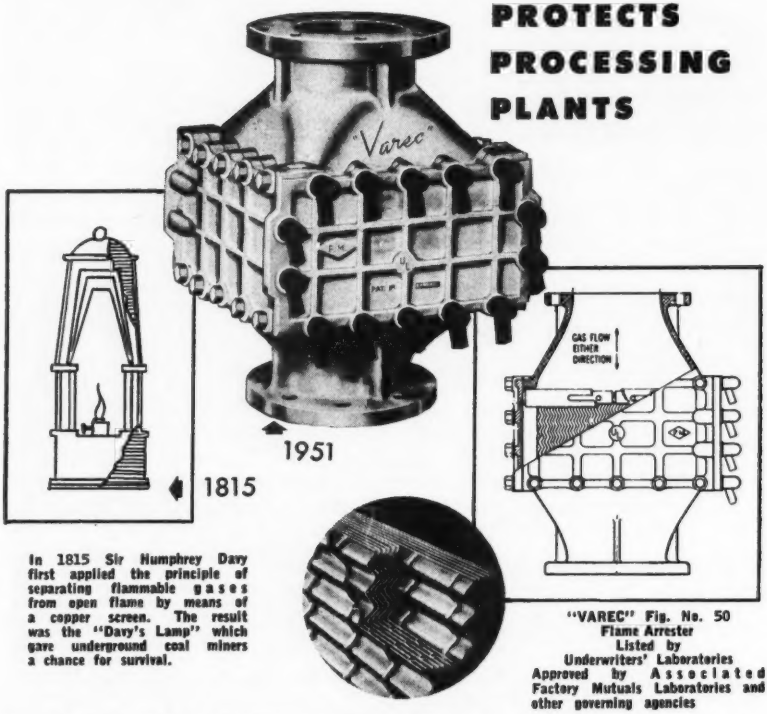
For complete data and specifications for erection, consult your local U.S.G. Architects' Service Representative, or write United States Gypsum, 300 W. Adams, Chicago 6, Ill.

*T. M. Reg. U. S. Pat. Off.

UNITED STATES GYPSUM The Greatest Name in Building

Chicago 6, Illinois

THIS MODERN "Davy's Lamp" PROTECTS PROCESSING PLANTS



In 1815 Sir Humphrey Davy first applied the principle of separating flammable gases from open flame by means of a copper screen. The result was the "Davy's Lamp" which gave underground coal miners a chance for survival.

"VAREC" Fig. No. 50 Flame Arrester Listed by Underwriters' Laboratories Approved by Associated Factory Mutuals Laboratories and other governing agencies

"VAREC" FLAME ARRESTERS utilize this age-old basic principle of heat transfer in protecting plants, equipment and lives against fire and explosion wherever gas or flammable liquids are stored.

They stop burning gas in piping from rapidly propagating thus preventing fire and explosion. Heat of the flame is dissipated through the many surfaces of the multiple corrugated aluminum plates within the unit. Resultant heat loss, plus the tortuous passageways through which the flame would have to pass, stops flame propagation just as the copper screen did in the "Davy's Lamp."

"Varec" Flame Arresters are a low cost investment in the utmost safety for your plants . . . consult your "Varec" representative or write direct.

NF 2

PROVED and APPROVED "Varec"

THE VAPOR RECOVERY SYSTEMS COMPANY

COMPTON, CALIFORNIA, U. S. A.

Cable Address: VAREC COMPTON USA (All Codes)

RELIABLE SPRAY SPRINKLER

- Greater Coverage!
- Lower Ceiling Temperatures!
- Faster Cooling of Hot Fire Gasses!
- Better Fire Extinguishment with Less Water!
- Fewer Sprinklers Operating Adjacent to Fire Area!

Incorporating the new principle of water distribution, the Model "C" Spray Sprinkler is another example of Reliable's leadership in new product design. All Reliable Sprinkler Devices are the assurance of the ultimate in fire protection . . . and have been protecting life and property for over 80 years! Reliable Sprinkler Devices are distributed . . . installed and serviced by Reliable's chain of licensed representatives located throughout the United States, Canada and foreign countries. A Reliable representative is as near as your phone. . . . Call him for a system designed to your specific needs!

Constant Fire Protection That's Always "Reliable"!

THE RELIABLE AUTOMATIC SPRINKLER CO. INC.

1852 SORG PAPERS MANUFACTURED SINCE 1852 - TESTED BY TIME REG. U.S. PAT. OFF. 1955

SYMBOL OF QUALITY

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Flame Resistant

KRAFT PAPERS

for

BUILDING PAPERS

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INSULATION BATTS and SHEATHING

Inquire About Sorg's FLAME RESISTANT KRAFT

by addressing

THE SORG PAPER COMPANY

MIDDLETOWN, OHIO

WITH A KIDDE CO_2 SYSTEM!

Let fire get a foothold, and a going concern is *gone*. Don't risk it – see that a Kidde Automatic CO_2 Fire Extinguishing System is on the job, and fire won't stand a chance.

A Kidde System goes into action at the first sign of fire – releases clouds of CO_2 over the blaze, smothers fire almost as soon as it starts. What's more, CO_2 leaves no mess to clean up *after* the fire.

Make sure that flammable liquids, dip tanks, spray booths are protected by a Kidde System.

Let Kidde guard record vaults, machinery and electrical equipment.

And for on-the-spot protection, nothing beats a Kidde portable. When fire strikes, anyone nearby just aims the horn, pulls the trigger, and swoosh! No more fire. Find out more about complete Kidde protection. Write today.

Walter Kidde & Company, Inc.
151 Main St., Belleville 9, N. J.

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The words 'Kidde', 'Lux', 'Lux-O-Matic', 'Fyre-Freez' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

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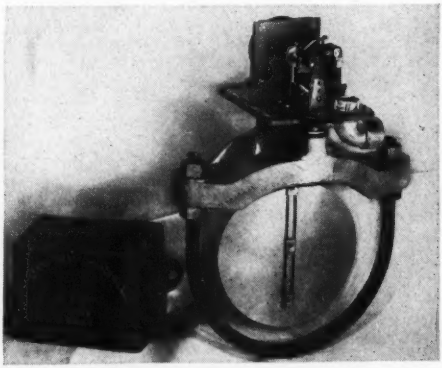
CENTRAL STATION SIGNALS, INC.

Manufacturers of all kinds of approved devices used in Central Station Systems or Class 'A' or Class 'B' Proprietary Fire Alarm Systems, either automatic or manual.

53 West 23rd STREET . . . . . NEW YORK 10, N. Y.



Model PRS-1

Sprinkler

Waterflow Alarm

This device is approved by Factory Mutual Laboratories and Underwriters' Laboratories, Inc.

- This device is also made as Model PRT-1, a coded waterflow transmitter.

5-inch size shown above. To install simply drill 2-inch hole in pipe.

- Also made in explosion proof models.
- Made in all sizes from 2½" to 8".
- Has instantly recycling pneumatic retarding device, which prevents false alarms.
- Has enclosed electrical contacts for 15 amp. 125 volts, A.C. and ½ AMP, 125 volts, D.C.

Tempo-Set Model A

Fire Detector

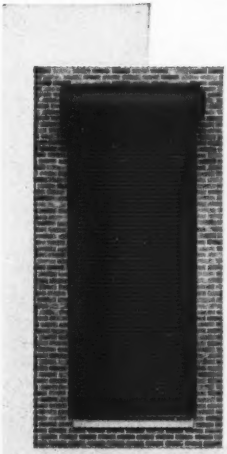
Underwriters' Laboratories, Inc. Approved.

- Self restoring and can be heat tested.
- Electrical contacts are silver or gold and are enclosed.
- Very reasonable price.

Size is 1⅜" x ⅜"

- Tempo-set Model A is approved in either open or closed circuit and the temperature ratings are 140 and 200 degrees.
- Approved spacing is 20' x 20'.
- Electric ratings are 125 volts 1 ampere, A.C. or 24 volts 0.5 ampere D.C., or less.

Automatic Rolling Steel
FIRE DOORS *and* WINDOW SHUTTERS
PREVENT SPREAD *of* FIRE!



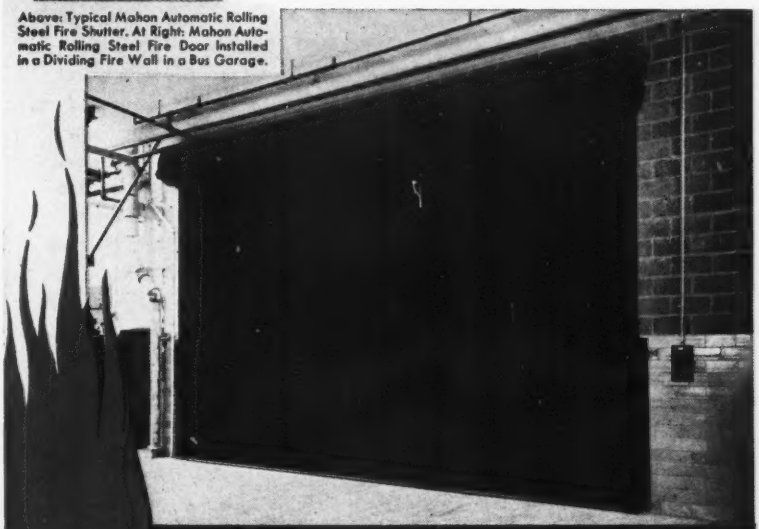
You need good automatic fire doors in fire walls, corridors, and vertical shafts . . . in some cases automatic rolling steel window shutters are necessary to protect your building and its contents from fires which may originate in nearby buildings. Many, many cases are on file which confirm that timely action of automatic rolling steel fire doors and window shutters have confined a fire to its point of origin and permitted its being extinguished with comparatively small damage. Make a survey of your building now, and don't delay action. You will find a Mahon Automatic Rolling Steel Fire Door or Window Shutter to meet each of your requirements—all bear the Underwriters' Label. These automatic fire doors may be operated manually or mechanically in every day use. If a fire should break out while they are in the open position, the automatic mechanism will close the door, cutting off drafts and preventing the spread of the fire. See Sweet's Files for complete information, or write for Catalog G-55.

THE R. C. MAHON COMPANY

Detroit 34, Michigan • Chicago 4, Illinois

Manufacturers of Automatic Rolling Steel Fire Doors and Window Shutters. Also Many Types of Standard General Service Rolling Steel Doors and Grilles, Insulated Metal Walls, and Steel Deck for Roofs, Floors and Partitions.

Above: Typical Mahon Automatic Rolling Steel Fire Shutter. At Right: Mahon Automatic Rolling Steel Fire Door Installed in a Dividing Fire Wall in a Bus Garage.



MAHON ROLLING STEEL FIRE DOORS and WINDOW SHUTTERS

ALL TYPES...ANY CLASS FIRE!

Since different fire hazards require different types of fire extinguishers, PYRENE—C-O-TWO manufactures all types...the finest and most complete line on the market today.

When doing business with PYRENE—C-O-TWO, you receive unbiased advice on what is best for your particular fire hazards, whether class A, B or C. Also, there is a well-rounded sales engineering organization having nation-wide representation to render top quality service wherever you're located.

Don't take unnecessary chances ... the extensive fire protection experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Get complete facts now!

Pyrene **PYRENE — C-O-TWO** C-O-TWO

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Sales and Service in the Principal Cities of United States and Canada

COMPLETE FIRE PROTECTION

portable fire extinguishers ... built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM

For Your Plant

DEPENDABLE WATER SERVICE

Plus

ASSURED FIRE PROTECTION

—in a single storage unit

PITTSBURGH
•DES MOINES
ELEVATED
STEEL TANKS

100,000-gallon P-DM dual service elevated steel tank at Hartford Special Machinery Co., Simsburg, Conn.

Combining 25,000 gallons of water storage for regular use with a fixed reserve of 75,000 gallons for sprinkler demand, this 100,000-gallon Pittsburgh-Des Moines Double-Ellipsoidal Elevated Steel Tank is of a type and size widely favored by industrial plants, hospitals, institutions and smaller communities.

The tank and its 100-foot tubular column tower are of welded construction. The pleasing appearance of the unit results from balanced, functional design; it is standardized throughout for maximum dollar value to the purchaser.

Write for our complete Elevated Tank Catalog, free on request.

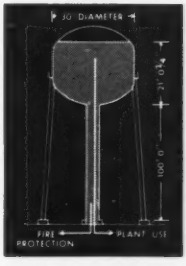

Diagram illustrates plant-use storage down to 75,000 gallon level. Balance of tank and riser capacity reserved for fire protection only, supplying automatic sprinkler system.

PITTSBURGH•DES MOINES STEEL CO.

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

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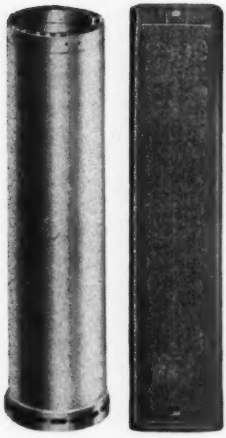
FOR GAS APPLIANCE VENTING

There's no doubt about

METALBESTOS



QC WV

METALBESTOS

for every Type B venting need

Approved by Underwriters' Laboratories. Correctly designed for use with all approved gas appliances requiring Type B vents. (Not for use with oil-burning appliances or gas-fired incinerators.)

QC METALBESTOS
Round Vent—for standard venting applications where space is not restricted.

WV METALBESTOS
Oval Vent—specially designed for in-the-wall venting.

IT'S SAFE

. . . . . because Metalbestos provides an inner "hot stack" for complete removal of *all* vent gases and a cooler, safer outer pipe to protect adjacent surfaces from overheating. Metalbestos was first to introduce the double-wall, insulated vent pipe — now accepted as the standard for proper venting.

IT'S DEPENDABLE

. . . . . because Metalbestos vents are designed to last the lifetime of the house. All-metal construction will not crack or break . . . precision made couplers stay gastight, won't pull apart. Assembled vent is strong and rigid and offers maximum protection against corrosion or accidental damage.

IT'S CORRECT

. . . . . because Metalbestos design is based on venting principles tested and proved by the most extensive venting research ever conducted. You can expect the best from Metalbestos — leader in gas venting.

TYPE B-W INSTALLATION KIT for safe, approved wall heater venting.

Simplifies venting of recessed wall heaters — fits inside 2 x 4 walls without furring out. Contains all fittings and directions needed to make safe, officially correct installation. Designed for use with WV Metalbestos pipe. Approved by Underwriters' Laboratories, Inc.

METALBESTOS DIVISION
WILLIAM WALLACE COMPANY • BELMONT, CALIF.

The AMAZING New

Star Spray Sprinkler!

With its

Unequalled Performance

Gives You . . . . . .

(MODEL C—UPRIGHT)

SUPERIOR PROTECTION — revolutionary in method — for any type of occupancy — no matter how severe the hazard . . . . . with

LESS WATER USED — more effectively and more efficiently — for total extinguishment and cooling. . . . All water discharged goes directly on the fire — not on the ceiling. . . . Ceilings are so cooled that no sprinkler will open unnecessarily. . . . . .

STAR SPRAY SPRINKLERS — the ultimate in modern fire protection — can replace former-type sprinklers without changes in piping. . . . . Available for installation in either **UPRIGHT** or **PENDENT** position.

Approved by Factory Mutual Laboratories
Listed by Underwriters' Laboratories, Inc.

Write for name and address of STAR licensed contractor nearest your location, to:

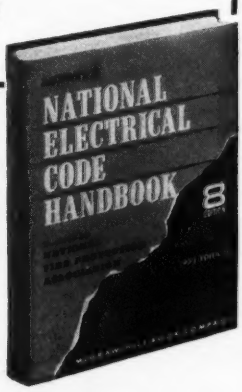
STAR SPRINKLER CORP.

Westmoreland and Collins Sts. — Philadelphia 34, Pa.

Licensees in all Principal Cities of the United States and Canada

Makes Electrical Code rules plain . . .

in terms of practical wiring and installation



Here's the famous book that makes everyone's work in practical electricity easier — the man who does the job — the man who has to certify its correctness. The scores of stipulations that make up the Code are made clear by the concise explanations given in this book. Now brought in line with the 1953 Code, and entirely revised in an easier-to-use arrangement, the book is more than ever an indispensable tool.

JUST OUT — 8th EDITION

Abbott's—

National Electrical Code Handbook

Published by McGraw-Hill Book Co.

Based on the 1953 Code

- 642 larger-sized, clearer-type pages
- Covers all additions and changes of the 1953 Code
- Now arranged in exactly the same sequence as the Code itself
- Meanings of rules now in contrasting type for greater ease of reading and use

Revised by CHARLES L. SMITH

Electrical Field Engineer of the National Fire Protection Association, Sec-Treas., Intl. Assn. Elec. Inspectors

642 pages, 5½ x 8, 394 illus., $7.50

This practical guide to the Code presents a wealth of factual data, and covers general requirements applying to all wiring systems. It lists Code rules by job title for all types of electrical installation. The new, improved layout makes for even quicker reference and guidance.

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10-day FREE EXAMINATION

Send your order to

NATIONAL FIRE PROTECTION ASSOCIATION

INTERNATIONAL

60 Batterymarch Street, Boston 10, Mass.

Use ROLAGRIP couplings for fast, low cost sprinkler installation

This is a 6" ROLAGRIP coupling for plain end pipe on a sprinkler bulk line in a midwestern aircraft plant. ROLAGRIP couplings and plain end steel pipe were used here because the contractor had to install a permanent, low cost sprinkler system *in a hurry.*

Because the sprinkler system was coupled with ROLAGRIPS, pipe came straight from the mill in economical mill run lots . . . ready to install. It required no special machining, handling or shipping preparation.

Installation time and labor were cut because ROLAGRIPS go on in three easy steps: (1) grease the special synthetic rubber gasket (to prevent pinching) and center it over the pipe ends; (2) lay ROLAGRIP halves over gasket; and (3) insert and tighten two bolts.

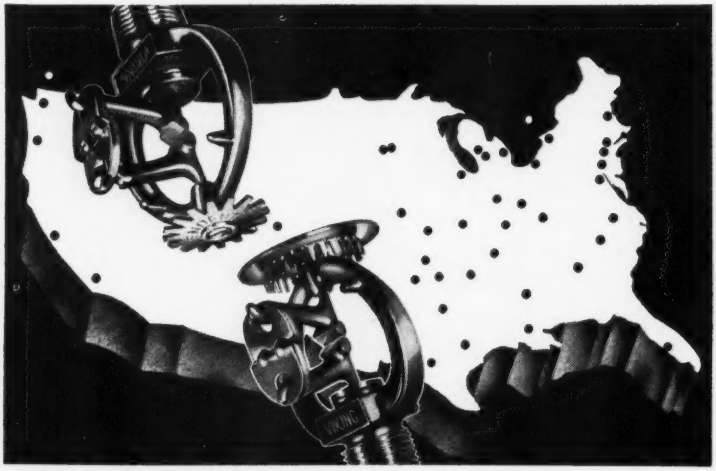
ROLAGRIPS will save *you* time and money, too. They come in 1½" to 12" sizes; are approved by Factory Mutual and listed by Underwriters' Laboratories.

Write for free folder!

Write today for prices and free illustrated folder NCF. (For grooved pipe, investigate approved GRUVAGRIP couplings — sizes ¾" to 14".)

GUSTIN-BACON MANUFACTURING COMPANY

210 West Tenth Street **Kansas City 6, Missouri**



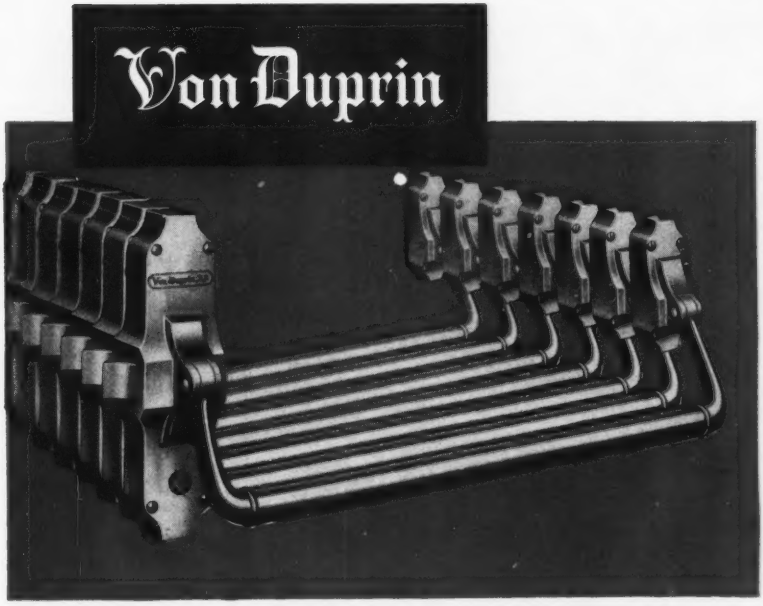
VIKING SPRINKLER FIRE PROTECTION

for any condition whatever it happens to be!

ATLANTA — Crawford & Slaten Co. BOSTON—Viking Automatic Sprinkler Co. BUFFALO—Viking Automatic Sprinklers, Inc. CHICAGO — Viking Automatic Sprinkler Co. CINCINNATI, CLEVELAND, INDIANAPOLIS, LOUISVILLE—Viking Sprinkler Co. DALLAS, HOUSTON, JACKSON (Miss.), MEMPHIS, NEW ORLEANS, N. LITTLE ROCK, OKLAHOMA CITY, SAN ANTONIO, TULSA — Texas Automatic Sprinkler Co. DETROIT—Viking Sprinkler Co. GRAND RAPIDS — Viking Sprinkler Co. of Western Mich. HIGH POINT, N. C. — Viking Sprinkler Co. HUNTINGTON, W. VA.—C. W. Hutchinson, Inc. DECATUR (Ill.), DENVER, KANSAS CITY (Kan.), OMAHA, SAINT LOUIS — Walton Viking Co. LOS ANGELES, SAN FRANCISCO—California Viking Sprinkler Co. HILLSIDE (N. J.), NEW YORK — Viking Sprinkler Co. PHILADELPHIA, WASHINGTON (D. C.) — Viking Sprinkler Co. PORTLAND (Ore.), SEATTLE, VANCOUVER (B. C.)—Viking Automatic Sprinkler Co. ST. PAUL, MINNEAPOLIS — Hudson Viking Sprinkler Co. TAMPA — Florida Fire Sprinklers, Inc. TORONTO (Ont.) — Viking Automatic Sprinklers, (Canada) Ltd. HASTINGS (Mich) — The Viking Corporation.

the VIKING corporation

HASTINGS, MICHIGAN



Builders of Fire and Panic Exit Devices Since 1908

● Back in 1908, Von Duprin built the very first panic device. Ever since that time, Von Duprin has been the leader in this highly specialized field . . . the leader in design, manufacturing and sales.

Each new design and development has had one prime purpose: to assure—*always*—safe exit in time of emergency.

Von Duprin devices—many of them serving heavy traffic with no major repairs for over 40 years—deliver dependable, day-in, day-out service with minimum maintenance.

Von Duprin offers a nation-wide group of trained consultants whose job it is to review particular installation requirements and recommend the *right* device—without obligation.

VONNEGUT HARDWARE CO.
VON DUPRIN DIVISION
INDIANAPOLIS 9, INDIANA

Canadian Consultants—Yale & Towne Mfg. Co., St. Catherine's, Ontario

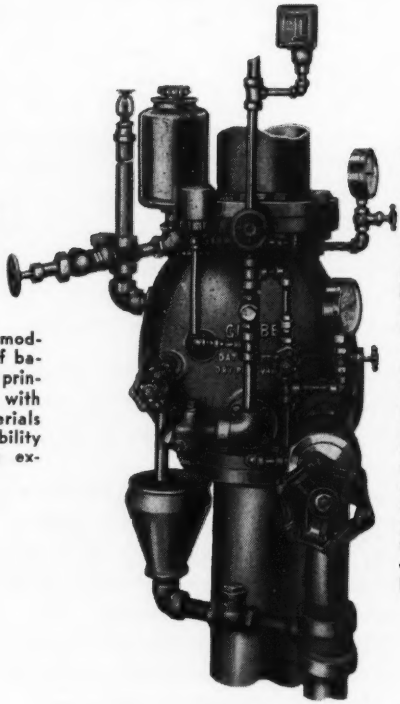
ANOTHER

GLOBE SAVEALL DEVICE

Dry Pipe Valve Model "F"

MODERN

represents the modern application of basic engineering principles balanced with high quality materials insuring durability over a long life expectancy.



COMPACT

The well known principles of differential and mechanical leverage for retaining the service water pressure from entering the system with reasonably low air pressures in the piping combined in a single air and water retaining clapper assembly, permits the minimum number of operating parts built within a removable unit, which simplifies the setting and maintenance procedures and insures positive performance within the ratio limits without pre-water leakage.

APPROVED BY ALL INSURANCE AUTHORITIES

Manufactured in 4" and 6" Size

Manufactured and Installed By

GLOBE AUTOMATIC SPRINKLER COMPANY

PHILADELPHIA, PA.

OFFICES IN PRINCIPAL CITIES

SAFER

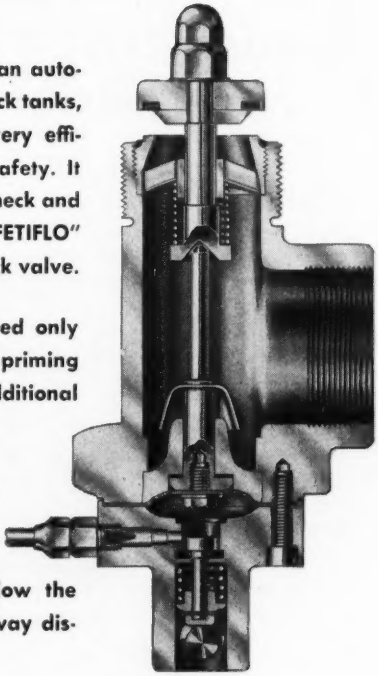
liquid handling for Industry

THIS NEW TOKHEIM HAND PUMP contributes to safer handling of volatile liquids wherever used. Stops wasteful dripping and slippery floors. Reduces fire hazard and accidents common to other methods of liquid transfer. Approved for handling petroleum liquids—ideal for many others. Available in hose and spout models—for drums, skid tanks and underground installations. Order from your dealer, your oil company or your Tokheim representative. **Write factory for literature.**

General Products Division
TOKHEIM CORPORATION
Designers and Builders of Superior Equipment Since 1901
1686 WABASH AVENUE FORT WAYNE 1, INDIANA
Canadian Distributor: H. Reeder, 205 Yonge St., Toronto

SAFE LP-GAS DELIVERY with S&J "SAFETIFLO"

THE Shand & Jurs "SAFETIFLO" is an automatic discharge valve for LP-Gas truck tanks, that provides greater LP-Gas delivery efficiency, combined with maximum safety. It is designed to replace excess-flow-check and shut-off valves currently in use. "SAFETIFLO" also serves as a truck tank filler check valve.



The S&J "SAFETIFLO" can be opened only by willful, manual operation of its priming cam, and when primed, only the additional pressure by the discharge pump can effect delivery. The valve seat is mounted INSIDE the truck tank, and the valve body outside the tank shell is provided with a weakness groove which insures breakoff below the valve seat in case accident tears away discharge lines.

For added protection, the "SAFETIFLO" is available with a fusible plug which melts at 165° F. and assures positive, automatic valve shut-off in event of fire.

Shand and Jurs Co.
BERKELEY 10, CALIFORNIA

NEW YORK
342 Madison Ave.

HOUSTON
M & M Bldg.

TULSA
Thompson Bldg.

CHICAGO
10209 S. Western Ave.

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714 W. Olympic Blvd.

REPRESENTATIVES:
SEATTLE: Nebor Supply Company, 3000 Western Avenue
MONTREAL: Lytle Engineering Specialties, Ltd., 340 Notre Dame St. W.
TORONTO: Lytle Engineering Specialties, Ltd., 83 Richmond St. W.
VANCOUVER: P. D. McLaren & Son, Ltd., 3277 Main Street
CARACAS: Sinclair Spence, C.A., Edificio Caripan
ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London, S.W. 1
Whessoe, Ltd., Works: Darlington, County Durham

Cut your Costs
—and Storage Problems

With

Nicerol

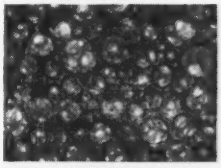
3% Foam Compound

THREE GALLONS of Nicerol and 100 gallons of water will produce over 1,000 gallons of Nicerol foam through a mechanical air pump. Changing and replacing strainers is reduced to a minimum, as Nicerol does not form sludge even after long storage. Its pH of 6·8 to 7·3 indicates neutrality, thus ensuring freedom from corrosion in valuable equipment, and in storage drums. A less obvious factor in Nicerol economy is its speed of effective action. Nicerol saved several hundred million dollars in World War II, and is still supplied under contract to several Navies and Air Forces throughout the World.

***NICEROL*—THE LONGER LASTING AIR FOAM**

Keeps longer in storage–Puts out more fire faster–Outlasts the fire

Magnification X30



Here's why Nicerol Air Foam gives greater heat resistance

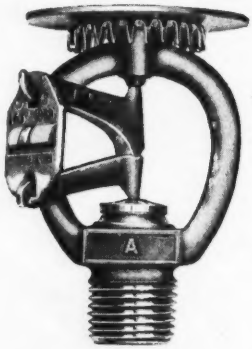
The minute closely-knit bubbles retain the maximum water content in a foam that is both adhesive and cohesive. This is the reason that air foam made from Nicerol resists fire breakdown, puts out more fire faster, and definitely outlasts the fire to prevent flash-backs.

INQUIRIES INVITED FROM DISTRIBUTORS AS WELL AS USERS.
FULL TECHNICAL AND COMMERCIAL DETAILS AVAILABLE FROM

GEORGE T. REYNOLDS & ASSOCIATES, P.O. BOX 395, THORNWOOD, NEW YORK., U.S.A.
BRITISH FIRE EXTINGUISHERS LTD., 222 SIMCOE ST., TORONTO 2B, ONTARIO, CANADA

Ahead Again!

CENTRAL SPRAY SPRINKLERS



Central Upright Spray Sprinkler Type "SSU"

BETTER FIRE PROTECTION

Combining all the superior features of the Central conventional type of automatic sprinklers (which 35 years of unequalled service have demonstrated) with the Central specially designed spray type of distributors, we present the complete line of Central Spray Sprinklers.

Central Spray Sprinklers are more effective and more efficient than any other type of sprinkler.

CHEAPER COST OF INSTALLATION

Their greater area of distribution and their lesser consumption of water combine to produce earlier extinguishment of fires with less water used, smaller pipe sizes and, in most cases, a lesser number of sprinklers required for the same areas.

Therefore, you save money in first installation cost and your fire damage is lessened if a fire occurs.

In every way, you profit by using the latest developed and the most efficient Central Spray Sprinklers.

Manufactured and Installed by

CENTRAL AUTOMATIC SPRINKLER COMPANY

Fourth Street and Cannon Avenue, Lansdale, Pa.

Cable Address — "Sprinklers" — Philadelphia

Licensees in principal cities in U. S. of America and Canada and throughout the world.

FOR FIRE PROTECTION SYSTEMS

TAPPING VALVE and SLEEVE

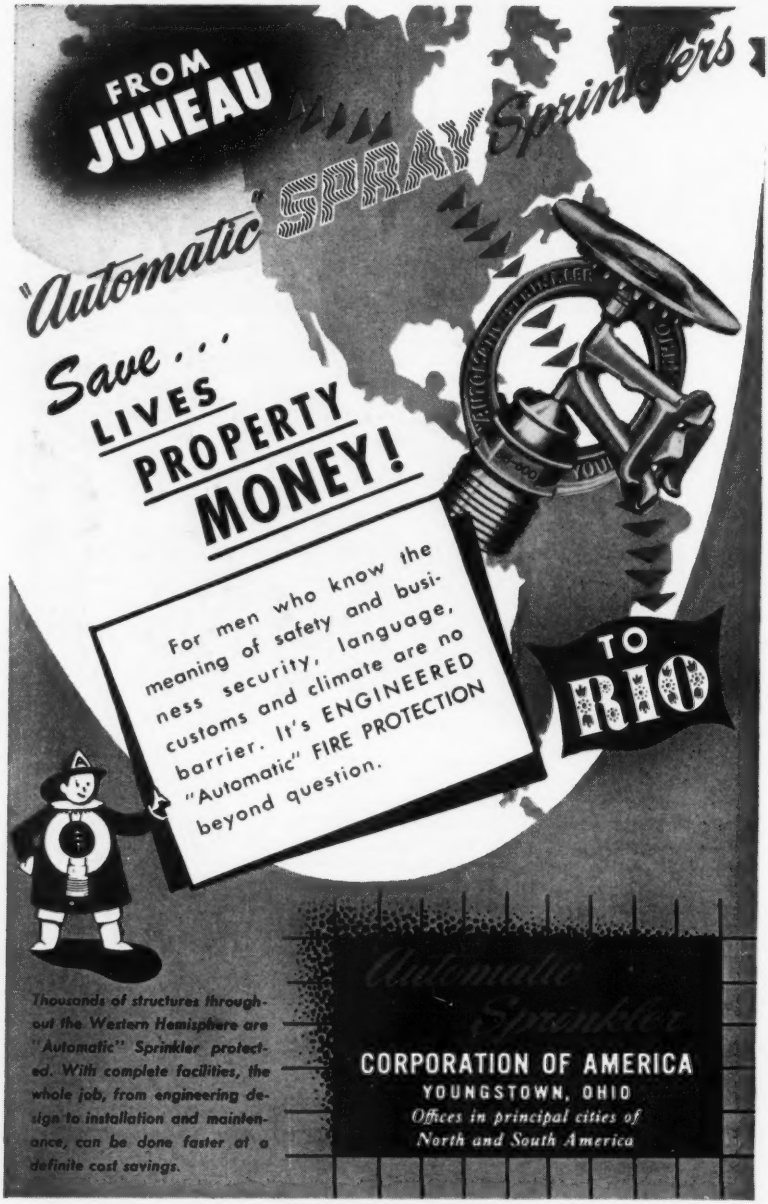
INDICATOR POST TYPE

M H

Designed for tapping a main under pressure. Flange on one side of valve bolts to sleeve; other side of valve may be hub or mechanical joint connection, either of which has special flange cast integral for attaching any standard make tapping machine. Can be furnished with or without bonnet flange for indicator post, or with rising stem for use in manhole or valve pit. Features of M & H sleeve are strong, heavy design and liberal length.

M & H Tapping Valves of this design are Underwriters approved and Tapping Sleeves are Manufacturer's Standard. For complete information, write or wire M & H VALVE AND FITTINGS COMPANY, Anniston, Alabama.

M&H PRODUCTS FOR WATER WORKS • FILTER PLANTS INDUSTRY • SEWAGE DISPOSAL AND FIRE PROTECTION


FROM
JUNEAU
"Automatic" SPRAY Sprinklers
Save...
LIVES
PROPERTY
MONEY!
For men who know the meaning of safety and business security, language, customs and climate are no barrier. It's ENGINEERED "Automatic" FIRE PROTECTION beyond question.
TO
RIO
Thousands of structures throughout the Western Hemisphere are "Automatic" Sprinkler protected. With complete facilities, the whole job, from engineering design to installation and maintenance, can be done faster at a definite cost savings.
Automatic Sprinkler
CORPORATION OF AMERICA
YOUNGSTOWN, OHIO
Offices in principal cities of
North and South America

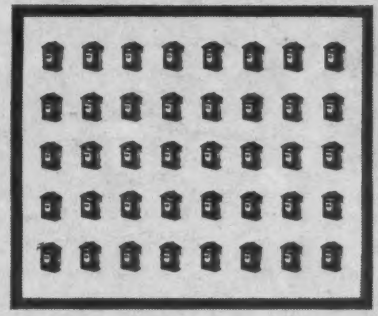
New Control System Reduces Costs
Improves Fire Alarm Flexibility

Gamewell Form 4 Unit Gives More Protection per Dollar

At lower cost, but of standard Gamewell high quality, the new Form 4 Control Unit stretches your fire alarm dollar. It enables you to put saved dollars into street boxes to insure wider public use. Compared with earlier models — dollar for dollar — you can buy the new Form 4 and up to 8 times as many boxes for the same overall cost!

5 street boxes with previous control systems

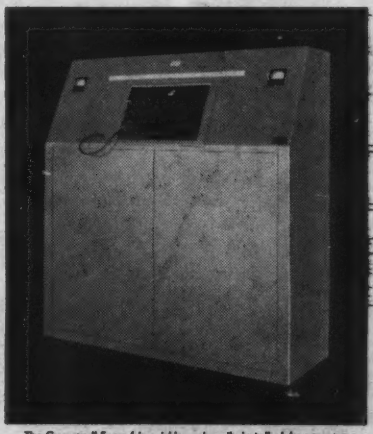
compared with up to 40 boxes with the new Form 4



The new Gamewell Form 4 is ideal for the small community, and for decentralizing big city Fire Alarm Systems.

Floor Space Problem Solved

In only 20% to 30% of the space previously used, you can install this system, including batteries. This "packaged" Fire Alarm Control Cabinet is *complete*, contains all devices needed for a central office setup.



The Gamewell Form 4 is quickly and easily installed, has reserve power for emergencies, is available in *any* capacity up to 10 circuits.

The Form 4 automatically repeats box alarms and warns if a circuit is broken. Delivery of the unit, which meets NBFU standards, can be made promptly.

Descriptive Bulletin Now Available

Bulletin 3A completely describes the Gamewell Form 4 Control Cabinet and its outstanding features. At no obligation, write today for a copy of Gamewell Bulletin 3A.

THE GAMEWELL COMPANY

Newton Upper Falls 64 • Massachusetts

When fire threatens...

Grinnell ProtectoSpray® drenches LPG tanks

When fire threatens LPG storage, you need plenty of water spray and vapor, fast and in the right places. That is why more owners of LPG bulk storage plants are turning to Grinnell for fire-protection engineering. Grinnell Automatic Fire Protection Systems are the result of more than three quarters of a century of progressive development. They have proved themselves effective guardians of life and property. It is only natural that they are increasingly specified for protection under the severest hazards.

In an LPG tank installation, any leak brings the chance of fire. To avert possible disaster, several things become immediately necessary:

1. The leak must be located and the leakage stopped. Grinnell ProtectoSpray provides a margin of safety for the personnel doing this work.

2. Heat transfer to the storage tanks must be prevented to avoid build-up of rupturing pressure within the tanks. Properly engineered fixed water spray protection provides effective cooling of tanks to prevent pressure build-up.

3. Positive air turbulence should be provided to hasten dilution of escaped gas to make the mixture too lean to burn. Water spray, without dependence upon wind to assist it, provides sustained air movement which hastens the dilution of escaped LPG.

4. Additional inert vapor should be provided to speed the dilution of escaped LPG. Water spray is an abundant source of such inert vapor, the finer droplets vaporizing to produce inert water vapor.

5. If escaped gases ignite, the wide and evenly distributed pattern of fine water droplets from Grinnell ProtectoSpray nozzles permits safe, controlled burning of gases.

Get the complete story. Write for a copy of "Water Spray Keeps LPG Storage A Safe Neighbor". Grinnell Company, Inc., 274 West Exchange Street, Providence, Rhode Island.

GRINNELL

PROTECTION AGAINST EVERY FIRE HAZARD